



इन्फॉर्मेटिक्स प्रैक्टिसेज Informatics Practices

कक्षा / Class XII
2026-27

विद्यार्थी सहायक सामग्री
Student Support Material



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संदेश

शिक्षा केवल पुस्तकों तक सीमित ज्ञान नहीं है; यह स्वयं को पहचानने, अपने विचारों को विस्तार देने और जीवन की चुनौतियों का आत्मविश्वास से सामना करने की सतत् यात्रा है। केन्द्रीय विद्यालय संगठन का सदैव यह प्रयास रहा है कि प्रत्येक विद्यार्थी के लिए ऐसा शिक्षण वातावरण हो, जहाँ जिज्ञासा को प्रोत्साहन मिले, सीखना आनंददायी बने और प्रत्येक बालक अपनी अंतर्निहित क्षमताओं को पहचानकर उन्हें विकसित कर सके।

राष्ट्रीय शिक्षा नीति 2020 ने शिक्षा को सिर्फ रटने से समझने, सूचना से ज्ञान और ज्ञान से जीवनोपयोगी दक्षताओं की ओर अग्रसर किया है। आज का समय कृत्रिम बुद्धिमत्ता (Artificial Intelligence – AI), डिजिटल नवाचार और निरंतर बदलती तकनीकों का है। ऐसे युग में केवल तथ्यों का ज्ञान पर्याप्त नहीं है; आवश्यक है कि विद्यार्थी मनन- चिंतन करना सीखें, प्रश्न पूछें, समस्याओं का समाधान खोजें और नए विचारों के साथ आगे बढ़ें। यही क्षमताएँ उन्हें भविष्य के लिए तैयार करेंगी।

इन्हीं उद्देश्यों को ध्यान में रखते हुए केन्द्रीय विद्यालय संगठन के पाँचों आंचलिक शिक्षा एवं प्रशिक्षण संस्थानों (ZIETs) के माध्यम से, समर्पित एवं अनुभवी शिक्षकों द्वारा कक्षा 9 से 12 के विद्यार्थियों के लिए यह विद्यार्थी सहायक सामग्री तैयार की गई है। यह केवल परीक्षा की तैयारी की संकलन सामग्री नहीं है, बल्कि विषयों को सरलता से समझने, अवधारणाओं को स्पष्ट करने, नियमित अभ्यास करने और आत्मविश्वास के साथ आगे बढ़ने का एक विश्वसनीय साथी है।

इस सामग्री में विषय-वस्तु को विद्यार्थियों की आवश्यकताओं के अनुरूप सरल, व्यवस्थित एवं दक्षता-आधारित दृष्टिकोण से प्रस्तुत किया गया है। मुझे प्रसन्नता है कि इसे हमारे शिक्षकों के अनुभव, नवाचार और विद्यार्थियों के प्रति उनकी प्रतिबद्धता ने समृद्ध बनाया है। मुझे विश्वास है कि यह सामग्री विद्यार्थियों की सीखने की यात्रा को अधिक सहज, रोचक और प्रभावी बनाएगी तथा उन्हें बोर्ड परीक्षाओं के साथ-साथ जीवन की व्यापक चुनौतियों के लिए भी तैयार करेगी।

मेरा विश्वास है कि जब एक जिज्ञासु विद्यार्थी, प्रेरित शिक्षक और सार्थक शिक्षण संसाधन एक साथ आते हैं, तब शिक्षा केवल उपलब्धि का माध्यम नहीं रहती, बल्कि व्यक्तित्व निर्माण की एक सशक्त प्रक्रिया बन जाती है। यही भावना इस विद्यार्थी सहायक सामग्री के केंद्र में है।

मेरी हार्दिक शुभकामनाएँ हैं कि आप सभी सीखने की इस यात्रा में निरंतर आगे बढ़ें, अपने सपनों को नए आयाम दें और ज्ञान, संवेदनशीलता तथा नवाचार के साथ राष्ट्र निर्माण में अपना महत्वपूर्ण योगदान दें।

शुभकामनाओं सहित।


(विकास गुप्ता)

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INFORMATICS PRACTICES Subject Code - 065

Class XII (2026-27)

1. Prerequisite: Informatics Practices – Class XI

2. Learning Outcomes

At the end of this course students will be able to:

- **Create Series, Data frames and apply various operations.**
- **Visualize data using relevant graphs.**
- **Design SQL queries using aggregate functions.**
- **Import/Export data between SQL database and Pandas.**
- **Learn terminology related to networking and the internet.**
- **Identify internet security issues and configure browser settings.**
- **Understand the impact of technology on society including gender and disability issues**

3. Distribution of Marks and Periods

Unit No	Unit Name	Marks
1	Data Handling using Pandas and Data Visualization	25
2	Database Query using SQL	25
3	Introduction to Computer Networks	10
4	Societal Impacts	10
	Project	-
	Practical	30
	Total	100

4. Unit Wise syllabus

Unit 1: Data Handling using Pandas -I

Introduction to Python libraries- Pandas, Matplotlib;

Data structures in Pandas - Series and Data Frames.

Series: Creation of Series from – ndarray, dictionary, scalar value; mathematical operations; head() and tail() functions; Selection, Indexing and Slicing.

Data Frames: creation- from dictionary of Series, list of dictionaries, Text/CSV files, display; iteration; Operations on rows and columns: add, select, delete, rename;

Head and Tail functions; Indexing using Labels, Boolean Indexing;
Importing/Exporting Data between CSV files and Data Frames.

Data Visualization: Purpose of plotting; drawing and saving following types of plots using Matplotlib – line plot, bar graph, histogram
Customizing plots: adding label, title, and legend in plots.

Unit 2: Database Query using SQL:

Revision of database concepts and SQL commands covered in class XI

Math functions: POWER (), ROUND (), MOD ().

Text functions: UCASE ()/UPPER (), LCASE ()/LOWER (), MID ()/SUBSTRING ()/SUBSTR (), LENGTH (), LEFT (), RIGHT (), INSTR (), LTRIM (), RTRIM (), TRIM ().

Date Functions: NOW (), DATE (), MONTH (), MONTHNAME (), YEAR (), DAY(), DAYNAME ().

Aggregate Functions: MAX (), MIN (), AVG (), SUM (), COUNT (); using COUNT (*). Querying and manipulating data using Group by, Having, Order by.

Working with two tables using equi-join.

Unit 3: Introduction to Computer Networks

Introduction to networks, Types of networks: PAN, LAN, MAN, WAN.

Network Devices: modem, hub, switch, repeater, router, gateway

Network Topologies: Star, Bus, Tree, Mesh.

Introduction to Internet, URL, WWW, and its applications- Web, email, Chat, VoIP.

Website: Introduction, difference between a website and webpage, static vs dynamic web page, web server and hosting of a website.

Web Browsers: Introduction, commonly used browsers, browser settings, add-ons and plug-ins, cookies.

Unit 4: Societal Impacts

Digital footprint, net and communication etiquettes, data protection, intellectual property rights (IPR), plagiarism, licensing and copyright, free and open-source software (FOSS), cybercrime and cyber laws, hacking, phishing, cyber bullying, overview of Indian IT Act.

E-waste: hazards and management.

Awareness about health concerns related to the usage of technology.

Project Work: The aim of the class project is to create tangible and useful IT application. The learner may identify a real-world problem by exploring the environment. e.g. Students can visit shops/business places, communities or other organizations in their localities and enquire about the functioning of the organization, and how data are generated, stored, and managed. The learner can take data stored in csv or database file and analyze using Python libraries and generate appropriate charts to visualize.

Learners can use Python libraries of their choice to develop software for their school or any other social good. Learners should be sensitized to avoid plagiarism and violation of copyright issues while working on projects.

Teachers should take necessary measures for this. Any resources (data, image etc.) used in the project must be suitably referenced. The project can be done individually or in groups of 2 to 3 students. The project should be started by students at least 6 months before the submission deadline.

Practical Marks Distribution

S. No	Unit Name	Marks
1	Programs using Pandas and Matplotlib	8
2	SQL Queries	7
3	Practical file (minimum of 15 programs based on Pandas, 4 based on Matplotlib and 15 SQL queries must be included)	5
4	Project Work (using concepts learned in class XI and XII)	5
5	Viva-Voce	5
	Total	30

5. Suggested Practical List

5.1 Data Handling

1. Create a panda's series from a dictionary of values and a ndarray
2. Given a Series, print all the elements that are above the 75th percentile.
3. Create a Data Frame quarterly sales where each row contains the item category, item name, and expenditure. Group the rows by the category and print the total expenditure per category.
4. Create a data frame for examination result and display row labels, column labels data types of each column and the dimensions
5. Filter out rows based on different criteria such as duplicate rows.
6. Importing and exporting data between pandas and CSV file

5.2 Visualization

1. Given the school result data, analyses the performance of the students on different parameters, e.g. subject wise or class wise.
2. For the Data frames created above, analyze, and plot appropriate charts with title and legend.
3. Take data of your interest from an open source (e.g. data.gov.in), aggregate and summarize it. Then plot it using different plotting functions of the Matplotlib library.

5.3 Data Management

1. Create a student table with the student id, name, and marks as attributes where the student id is the primary key.
2. Insert the details of a new student in the above table.
3. Delete the details of a student in the above table.
4. Use the select command to get the details of the students with marks more than 80.
5. Find the min, max, sum, and average of the marks in a student marks table.
6. Find the total number of customers from each country in the table (customer ID, customer Name, country) using group by.
7. Write a SQL query to order the (student ID, marks) table in descending order of the marks.

UNIT 1: Data Handling Using Pandas and Data Visualisation

DATA HANDLING USING PANDAS –I

1.Introduction to Python libraries:

Python libraries contain a collection of built in modules which can be used in our programs. Examples for python libraries are 'numpy', 'pandas' and 'matplotlib'. Pandas (panel data) is a Python's library for data analysis.

It is the most famous Python library for data science that offers powerful and flexible data structures which make data analysis and manipulation easy. It is built on top of two core libraries – NumPy and Matplotlib that give us a single and convenient place for data analysis and visualization work. It is developed by **Wes McKinney**.

The library 'pandas' has three data structures namely **Series, DataFrame and Panel**.

Data Structure is an organization of data in a computer in such a way that it can be accessed efficiently.

Differences between 'pandas' and 'numpy':

- I. **pandas** DataFrame can have data of different types while **numpy** array can have homogeneous data (same type of data).
- II. **pandas** is used when data is in tabular format and **numpy** is used when we have to manipulate numeric, array-like data.
- III. **pandas** are slightly slower due to higher abstraction whereas **numpy** are very fast for numerical computation.
- IV. **pandas** support multiple data types whereas **numpy** supports operations on only numerical data.

Command to install pandas:

To install pandas, type: **pip install pandas**

Note: We can install pandas using the pip command in your terminal, command prompt, or any Python environment that supports package installation.

Series Data Structure:

Series is like a one-dimensional array having a sequence of homogenous data **with data labels called index**. Data can be of any type (int, float, string etc). By default, the index starts with zero but other indexes are also permitted. Even if we use our own label, the default index will be available. Default index starts with 0 (first element), 1(second element), 2 (third element) and so on. It is a data structure with two arrays; out of them one array works as index (labels) and the second array works as original data.

Series size is immutable: Once a series is created, its size cannot be changed. If we add/delete an element, a new series is created by Python internally and new series object will be created.

Series Data is mutable: Series data can be changed.

Example:

```
import pandas as pd
# Create a Series
s = pd.Series([10, 20, 30])
```

OUTPUT:

```
0  10
1  20
2  30
dtype: int64
```

As the data is mutable in series we can change the value at any index.

In this example the value of index 1 is modified.

```
import pandas as pd  
s = pd.Series([10, 20, 30]) # Create a Series
```

```
s[1] = 99
```

```
print(s)
```

OUTPUT:

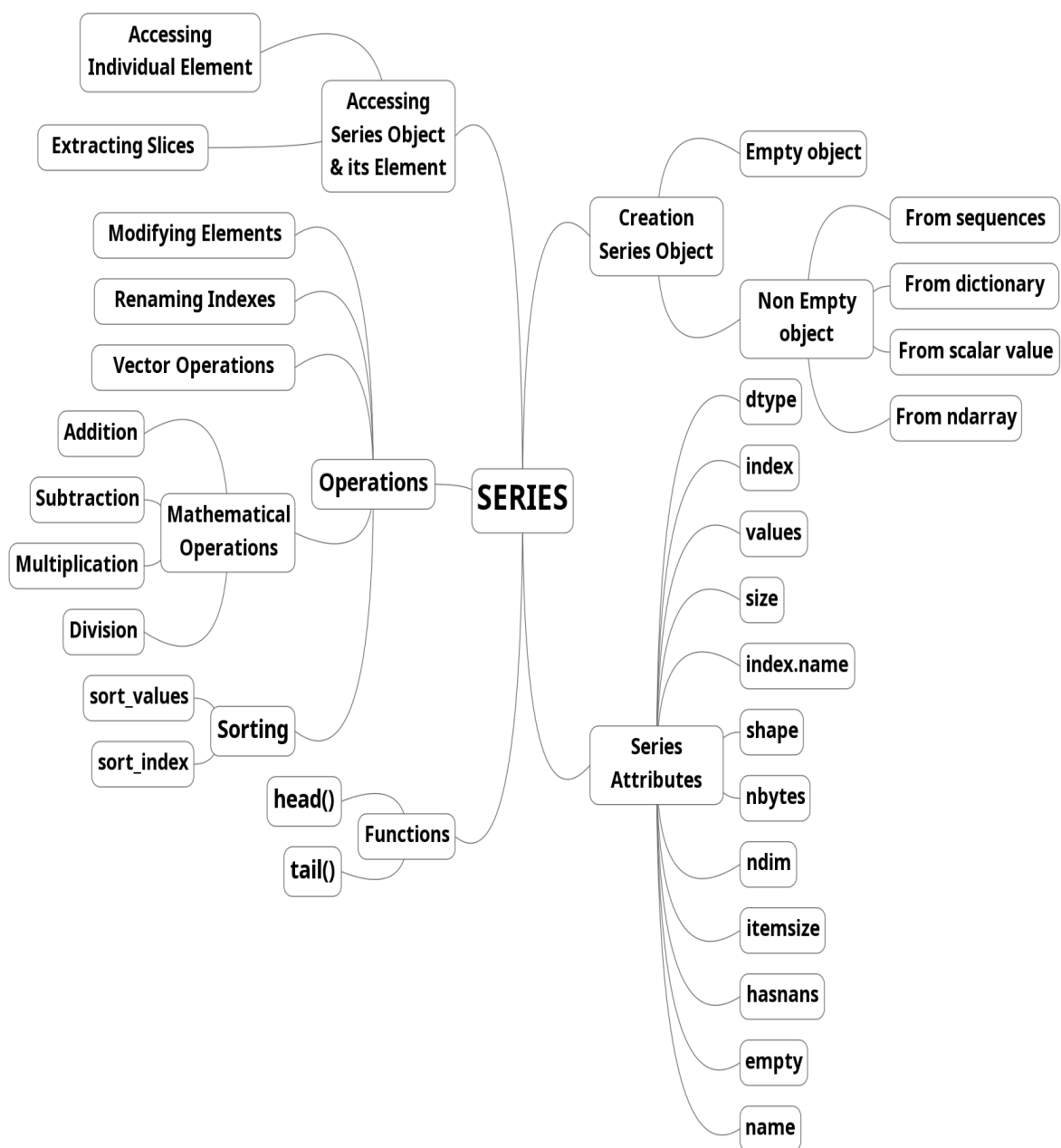
```
0 10
```

```
1 99
```

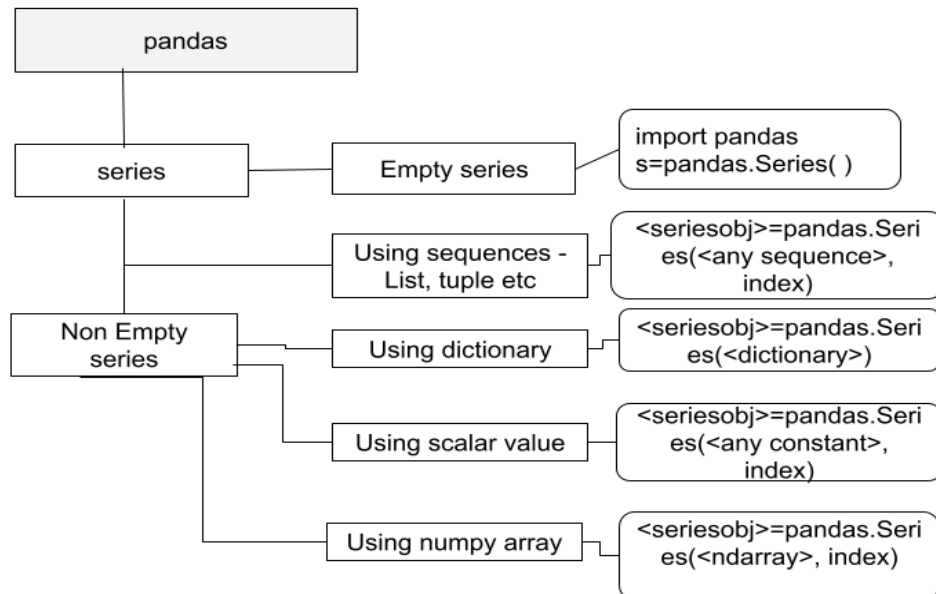
```
2 30
```

```
dtype: int64
```

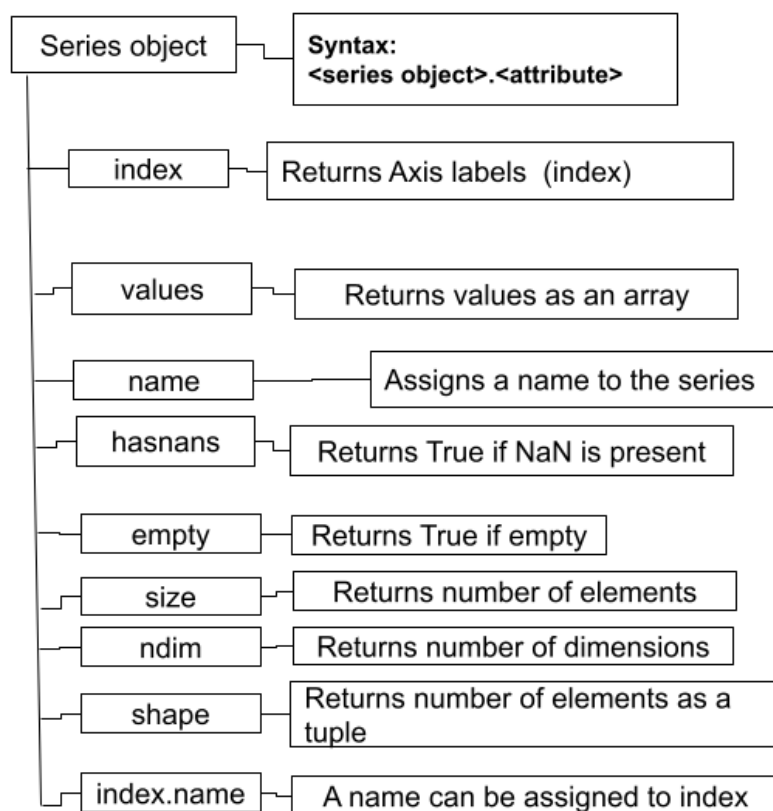
Concept Maps



Concept Map - Creating Series



Attributes of Series:



Creating Series Objects

Series Objects can be created by using the **Series()** method and for this we have to **import the pandas library** using the code: **import pandas**

I. Creating an Empty Series

Syntax: <Series Object Name>=pandas.Series()

Example: import pandas as pd #here, pd is a short name given to pandas

S1=pd.Series() # S1 is an empty series.

II. Creating non-empty Series objects

Syntax: <Series Object>=pandas. Series (data, index, dtype)

Here, data can be Python sequence like list, tuple or string or Python dictionary or scalar value or ndarray, index is a data label, dtype is datatype.

Specifying Data as A Python Sequence

- Here, data can be in the form of tuple, list or string.

PROGRAM: using a tuple and default index	OUTPUT
import pandas as pd s1=pd.Series((10,20,30,40)) print(s1)	0 10 1 20 2 30 3 40 dtype: int64
PROGRAM: series using a list, specifying index	OUTPUT
import pandas as pd s2=pd.Series(data = [10,20,30,40,50], index=["a","b","c","d","e"]) print(s2)	a 10 b 20 c 30 d 40 e 50 dtype: int64
PROGRAM: series using a list of strings	OUTPUT
import pandas as pd months=["Jan","Feb","March","April","May"] days = [31,28,31,30,31] s3=pd.Series(days,months) print(s3)	Jan 31 Feb 28 March 31 April 30 May 31 dtype: int64

PROGRAM: series using a sequence generated using range()	OUTPUT
<pre>import pandas as pd s4=pd.Series(data=[i for i in range(1,10,2)], index=[i for i in \ range(1,6)]) print(s4) Note: When a statement is too long, we can use \ to continue it on the next line.</pre>	<pre>1 1 2 3 3 5 4 7 5 9 dtype: int64</pre>
PROGRAM: specifying index using range()	OUTPUT
<pre>import pandas as pd s5=pd.Series(data=range(1,10,2), index=range(1,6)) print(s5)</pre>	<pre>1 1 2 3 3 5 4 7 5 9 dtype: int64</pre>
PROGRAM: Series with NaN values	OUTPUT
<pre>import pandas as pd import numpy as np s6=pd.Series([1,2,3,4, np.NaN,6]) print(s6)</pre>	<pre>0 1.0 1 2.0 2 3.0 3 4.0 4 NaN 5 6.0 dtype: float64</pre>

Specifying Data as a Scalar or Constant

- Here, data is a scalar value / constant value.
- This constant value shall be repeated to match the length of the index.

PROGRAM	OUTPUT
<pre>import pandas as pd s1=pd.Series(100, index=[10,20,30]) print(s1)</pre>	<pre>10 100 20 100 30 100 dtype: int64</pre>
<pre>s2=pd.Series(20,index=['a', 'b','c','d']) print(s2)</pre>	<pre>a 20 b 20 c 20 d 20 dtype: int64</pre>
<pre>s3=pd.Series("Wel-Come", index=["Ajay", "Vijay"]) print(s3)</pre>	<pre>Ajay Wel-Come Vijay Wel-Come dtype: object</pre>

Specifying Data as a Python Dictionary

A series object can be created by specifying indexes and values through a dictionary.

PROGRAM	OUTPUT
<pre>import pandas as pd s1=pd.Series({'A':40,'B':43,'C':45,'D':41}) print(s1) s2=pd.Series({"Jan":31,"Feb":28,"Mar":31}) print(s2)</pre>	<pre>A 40 B 43 C 45 D 41 dtype: int64 Jan 31 Feb 28 Mar 31 dtype: int64</pre>

Specifying Data as an 'ndarray' also known as numpy array

I. ndarray can be created from following function:

1. **array() function** ex: np.array([1,2,3,4,5])

PROGRAM	OUTPUT
<pre>import pandas as pd import numpy as np print(pd.Series(np.array ([1,2,3,4,5])))</pre>	<pre>0 1 1 2 2 3 3 4 4 5 dtype: int64</pre>

2. **arange function** ex: np.arange(1,6,2)

PROGRAM	OUTPUT
<pre>import pandas as pd import numpy as np print(pd.Series(np.arange(1,6,2)))</pre>	<pre>0 1 1 3 2 5 dtype: int64</pre>

3. **linspace function** ex: np.linspace(10,20,5)

Note: **numpy.linspace()** is a function in the NumPy library used to create an array of evenly spaced numbers over a specified range.

PROGRAM	OUTPUT
Example 1: <pre>import pandas as pd import numpy as np print(pd.Series(np.linspace(10,20,5)))</pre> Note: syntax: linspace(start, stop,num) 5 numbers equally spaced between 10 and 20 (inclusive): Example 2: <pre>import pandas as pd import numpy as np print(pd.Series(np.linspace(10,25,4)))</pre>	Output of Example 1: <pre>0 10.0 1 12.5 2 15.0 3 17.5 4 20.0 dtype: float64</pre> Output of Example 2 <pre>0 10.0 1 15.0 2 20.0 3 25.0 dtype: float64</pre>

4. **tile function** ex: np.tile([1,2],3)

Note: The **numpy.tile()** function is used to **construct an array by repeating another array** a specified number of times.

PROGRAM	OUTPUT
<pre>import pandas as pd import numpy as np print(pd.Series(np.tile([1,2],3)))</pre> Note: np.tile([1, 2], 3) repeats the array [1, 2] three times.	<pre>0 1 1 2 2 1 3 2 4 1 5 2 dtype: int64</pre>

Attributes of Series Object

- i) Some common attributes related to series object are described below and are accessed using the syntax:

<Series object>.<Attributename>

```
import pandas as pd
s1=pd.Series([10,20,30], index=['a','b','c'])
print(s1)
```

Attribute	Description	OUTPUT
Series.index	Returns index of the series. Ex.: s1.index	Index(['a', 'b', 'c'], dtype='object')
Series.values	Returns ndarray. Example: s1.values	[10 20 30]
Series.index.name	It can be used to assign new name to index s1.index.name="Newname" Ex.: s1.index.name='Roll number'	Roll number a 10 b 20 c 30 dtype: int64
Series.dtype	Return data type object. Ex.: s1.dtype	int64
Series.shape	Returns no. of elements including missing or empty values (NaN) in a form of tuple. E.g. s1.shape	(3,)
Series.nbytes	Returns no. of bytes taken by series object. Ex.: s1.nbytes	24
Series.ndim	Returns dimension (no. of axis) Ex.: s1.ndim	1
Series.size	Returns no. of elements in the series object. Ex. s1.size	3
Series.values.itemsize	Returns the no. of bytes allocated to each data item. Ex. s1.values.itemsize	8

Series.hasnans	Returns true if there are any NaN. Ex. s1.hasnans	False
Series.empty	Returns true if series object is empty. Ex. s1.empty	False
Series.name	Return or assign new name to series. Ex. s1.name = 'newname' s1.name='s2' print(s1)	a 10 b 20 c 30 Name: s2, dtype: float64

Accessing Elements of a Series

There are two common ways for accessing the elements of a series: **Indexing** and **Slicing**. Indexing means use index to access the elements. There are two types of indexes, positional index - an integer value and labelled index - any user defined label.

i) Accessing Individual Element from a Series

Syntax: <Series Object Name>[<valid index>]

Consider S1=pd.Series([10,20,30,40,50])

Example: S1[0]

PROGRAM	OUTPUT
import pandas as pd S1=pd.Series([10,20,30,40,50]) print(S1[0]) print(S1[3])	10 40

ii) Extracting Slices from Series Object

To extract slices, specify [start: stop: step] where start and stop signify the positions of elements not the indexes.

PROGRAM	OUTPUT
import pandas as pd s1=pd.Series(data=[10,20,30,40,50], index = [i for i in \ "ABCDE"]) print(s1) Note: When a statement is too long, we can use \ to continue it on the next line.	A 10 B 20 C 30 D 40 E 50 dtype: int64
print(s1[:4])	A 10 B 20 C 30 D 40 dtype: int64
print(s1[-4:])	B 20 C 30 D 40 E 50 dtype: int64
print(s1[:])	A 10 B 20 C 30 D 40 E 50

	dtype: int64
print(s1[1:4])	B 20 C 30 D 40 dtype: int64
print(s1[::-1])	E 50 D 40 C 30 B 20 A 10 dtype: int64

iii) Indexing and accessing can also be done using `.iloc[ ]` and `.loc[ ]` methods

- i) **`.iloc[ ]`**- `iloc` is used for indexing or selection based on position, i.e we have to specify integer index for selection by position. It refers to position-based indexing.
- ii) **Syntax:** `series.iloc[<row number / index range>]`
- iii) **`.loc[ ]`**- `loc` is used for indexing or selection based on name, i.e. we have to specify row label / location-name. It refers to name-based or label-based indexing.
- iv) **Syntax:** `series.loc[<list of row labels / row names>]`

PROGRAM	OUTPUT
import pandas as pd s1=pd.Series(data=[10,20,30,40,50], index=['A','B','C','D','E']) print(s1.iloc[1:4])	B 20 C 30 D 40 dtype: int64
print(s1.loc["B":"E"])	B 20 C 30 D 40 E 50 dtype: int64

Operations on Series Object

A. Modifying Elements of Series Object

Syntax:

- A. `<SeriesObject>[<index>] = <new_data_value>`
- B. `<SeriesObject>[start:stop] = <new_data_value>`

PROGRAM	OUTPUT	
	Statement 1	Statement 2
import pandas as pd d1=[10,20,30,40,50] s1=pd.Series(d1) s1[1]=100 print(s1) #Statement 1 s1[3:5]=500 print(s1) # Statement 2	0 10 1 100 2 30 3 40 4 50 dtype: int64	0 10 1 100 2 30 3 500 4 500 dtype: int64

B. Deleting Element from Series Object

Syntax: `<SeriesObject>.drop(<index to be removed>)`

PROGRAM	OUTPUT
---------	--------

	Statement 1	Statement 2
import pandas as pd d1=[10,20,30,40,50] s1=pd.Series(d1) print(s1) #Statement 1 s1=s1.drop(2) print(s1) #Statement 2	0 10 1 20 2 30 3 40 4 50 dtype: int64	0 10 1 20 3 40 4 50 dtype: int64

Vector Operations on Series Objects

- A. Vector operations means that if you apply a function or expression then it is individually applied on each item of the object.
- B. Suppose S1 is a series object
(i) $s1+2$ (ii) $s1*3$ (iii) $s1>15$ (iv) $s2=s1**2$

PROGRAM	OUTPUT			
	St1	St2	S3	S4
import pandas as pd d1=[10,20,30,40,50] s1=pd.Series(d1) print(s1) # St 1 print(s1+2) #St 2 print(s1>15) #St3 print(s1**2) #St4	0 10 1 20 2 30 3 40 4 50 dtype: int64	0 12 1 22 2 32 3 42 4 52 dtype: int64	0 False 1 True 2 True 3 True 4 True dtype: bool	0 100 1 400 2 900 3 1600 4 2500 dtype: int64

Arithmetic operations on Series Objects

- Arithmetic operations can also be performed between series objects like addition, subtraction, multiplication, division etc.
- Output is NaN - when index of series does not match or either one of the values is NaN

Addition and Subtraction operations on Series

PROGRAM	OUTPUT	
	St1	St2
import pandas as pd s1=pd.Series([10.5, 12.4, 21.4, 14.6]) s2=pd.Series([10.5,12.4, 21.4, 14.6], index=['a','b','c','d']) s3=pd.Series([20.15, 2.41, 21.14, 4.65]) s4=pd.Series([20.15, 2.41, 21.14, 4.65, 8.19, 97.6]) s5=pd.Series([11.5, 12.4, 1.4, 34.6], index=['a','b','c','d']) print(s1+s4) #St1 print(s1-s3) #St2	0 30.65 1 14.81 2 42.54 3 19.25 4 NaN 5 NaN dtype: float64	0 -9.65 1 9.99 2 0.26 3 9.95 dtype: float64

Multiplication and Division operations on Series

PROGRAM	OUTPUT
---------	--------

	St1	St2
import pandas as pd s1=pd.Series([10.5,12.4,21.4,14.6]) s2=pd.Series([10.5,12.4,21.4,14.6],index=['a','b','c','d']) s3=pd.Series([20.15,2.41,21.14,4.65]) s4=pd.Series([20.15,2.41,21.14,4.65,8.19,97.6]) s5=pd.Series([11.5,12.4,1.4,34.6],index=['a','b','c','d']) print(s1*s3) #St1 print(s1/s3) #St1	0 211.575 1 29.884 2 452.396 3 67.890 dtype: float64	0 0.521092 1 5.145228 2 1.012299 3 3.139785 dtype: float64

Filtering Entries in Series Objects

We can filter out entries from a series object using expressions that are of Boolean type (i.e. the expression that yield a Boolean value) as per following syntax:

<Series object>[<Boolean expression on Series Object>]

PROGRAM	OUTPUT		
	Statement1	Statement2	Statement3
import pandas as pd s1=pd.Series([10.5,2.4,21.4,1.6,98.9]) s2=pd.Series([10.5,12.4,21.4,4.6,98.9], index=['a','b','c','d','e']) print(s1>5) # Statement1 print(s1[s1>5]) #Statement2 print(s2<10) #Statement3	0 True 1 False 2 True 3 False 4 True dtype: bool	0 10.5 2 21.4 4 98.9 dtype: float64	a False b False c False d True e False dtype: bool

Sorting Series Values: Values of Series object can be sorted on the basis of values and indexes using **sort_values([ascending=True|False])**,
sort_index([ascending=True|False]).

where, argument ascending is optional. By default, it is True.

PROGRAM	OUTPUT	
	Statement1	Statement2
#Consider the series object s1 print(s1.sort_values()) #Statement 1 print(s1.sort_values(ascending=False)) #Statement 2	3 1.6 1 2.4 0 10.5 2 21.4 4 98.9 dtype: float64	4 98.9 2 21.4 0 10.5 1 2.4 3 1.6 dtype: float64

A. **<Series_object>.sort_index([ascending=True|False])>**

where, argument ascending is optional. By default, it is True.

PROGRAM	OUTPUT	
	Statement1	Statement2
import pandas as pd s1=pd.Series([10.5,2.4,21.4,1.6,98.9]) print(s1.sort_index()) print(s1.sort_index(ascending=False))	0 10.5 1 2.4 2 21.4 3 1.6 4 98.9 dtype: float64	4 98.9 3 1.6 2 21.4 1 2.4 0 10.5 dtype: float64

The head() and tail() Functions

- A. head() and tail() functions : The head(n) function is used to fetch first n rows from pandas object and tail(n) function returns last n rows from pandas object.
- B. If n is missing or not provided then by default, they will return first 5 rows and last 5 rows respectively.

- C. Syntax: 1. **<pandas obj>.head([n])**
2. **<pandas obj>.tail([n])**

Ex.: **s1.head(3), s1.head(), s1.tail(4), s1.tail()**

PROGRAM	OUTPUT			
	St1	St2	St3	St4
import pandas as pd	0 10	0 10	4 98	6 3
s1=pd.Series([10,2,21,1,98,2,3,5,6])	1 2	1 2	5 2	7 5
print(s1.head()) #St1	2 21	2 21	6 3	8 6
print(s1.head(7)) #St2	3 1	3 1	7 5	dtype:
print(s1.tail()) #St3	4 98	4 98	8 6	int64
print(s1.tail(3)) #St4	dtype:	5 2	dtype:	
	int64	6 3	int64	
		dtype:		
		int64		

Multiple Choice Questions

1	Which two data structures are commonly used in Pandas? A. Array and Tuple B. List and Dictionary C. Series and DataFrame D. Stack and Queue Answer: C. Series and DataFrame
2	What is a Series in Pandas? A. A two-dimensional labeled array B. A one-dimensional array with labeled data C. A type of function in Pandas D. A spreadsheet file format Answer: B. A one-dimensional array with labeled data
3	In a Pandas Series, what is the default type of index assigned to values? A. Alphabetic labels B. Custom-defined names C. Numeric labels starting from one D. Numeric labels starting from zero Answer: D. Numeric labels starting from zero
4	Which of the following best describes the index in a Pandas Series? A. A row number in a table B. A name given to the Series C. A data label associated with each value in the Series D. The length of the Series Answer: C. A data label associated with each value in the Series
5	In pandas library of Python, a one-dimensional array containing a sequence of values of any datatype is known as:

	A. DataFrame B. Histogram C. Series D. Panel Answer: C.Series
6	Which of the following command is used to display the first three elements of a series, 'S' ? A. S.head() B. S.head(4) C. S.Head() D. S.head(3) Answer: D. S.head(3)
7	Which of the following command is used to display the last three elements of a series, 'S' ? A. S.Tail B. S.tail() C. S.tail(3) D. S.Tail(3) Answer: C. S.tail(3)
8	Which attribute can be used to name the series? A. name B. index C. Name D. seriesname Answer: A. name
9	Which attribute returns a list of values in the series object? A. value B. values C. elements D. ditems Answer: B . values

10	Which attribute checks the existence of NaN value in a Series? A. len() B. count() C. values D. hasnans Answer: D.hasnans
11	Which of the following can be used to create a Pandas Series? A. List B. Dictionary C. Scalar value D. All of the above Answer: D.All of the above
12	What will be the output of the following code? import pandas as pd s = pd.Series([10, 20, 30], index=['a', 'b', 'c']) print(s['b']) A.10 B. 20 C. b D. Error Answer: B. 20
13	What does the dtype property of a Series return? A. Number of elements B. Data type of the Series elements C. Memory size D. None of the above Answer: B. Data type of the Series elements
14	Which of the following statement will import pandas library? A. import panndas as py B. import pandas as pd C. import panda as pd D. Import pandas as pd Answer: B. import pandas as pd

Short Answer Type Questions	
1	Find the output of the following Python code <pre>import pandas as pd S1=pd.Series([1,2,2,7,5], index = ['a', 'b', 'c', 'd', 'e']) print(S1) print(S1.head(2))</pre> Answer: <pre>a 1 b 2 c 2 d 7 e 5 dtype: int64</pre> <pre>a 1 b 2 dtype: int64</pre>
2	“Series has immutable index”. Explain? Answer: Once a series is created, the size or structure of index cannot be changed in place whereas the entire index can be replaced. One cannot add more elements to a series or remove elements from the original series.
3	Give the output of the following code: <pre>import pandas as pd # Dictionary with names as keys and marks as values marks_dict = { 'Alice': 85, 'Bob': 78, 'Charlie': 92, 'David': 76, 'Eva': 89 } # Creating a Series from the dictionary marks_series = pd.Series(marks_dict) # Display the Series print("Student Marks:\n") print(marks_series)</pre>
	Answer: Student Marks: <pre>Alice 85 Bob 78 Charlie 92 David 76 Eva 89 dtype: int64</pre>
4	Consider the following series, ‘Student’, and answer the questions that follow <pre>Alice 85 Bob 78 Charlie 92 David 76 Eva 89</pre>

	dtype: int64 a) Display the values of this series b) Display the indexes c) Find how many elements are there in this series d) Display the mark of 'Alice' Answers: a) print(Student.values) b) print(Student.index) c) print(Student.size) d) print(Student['Alice'])
5	Consider the following series, 'Student' , and answer the questions that follow Alice 85 Bob 78 Charlie 92 David 76 Eva 89 dtype: int64 a) Increase the marks of all the students by 5 b) Display the details if mark is greater than 80 c) Display the marks of Alice, Eva d) Modify the marks of 'Alice'. New mark is 95 Answers: a) Student = Student+5 b) print(Student[Student>80]) c) print(Student[['Alice', 'Eva']]) d) Student['Alice'] = 95
6	Write the output of the following code: <pre>import pandas as pd S1=pd.Series([10,15,16,12,18,19], index=['A', 'B', 'C', 'D', 'E', 'F']) print(S1[0:3]) print("_____") print(S1['A':'B']) print("_____") print(S1[0:5:2]) print("_____") print(S1['A':'F':2])</pre> Answers: A 10 B 15 C 16 dtype: int64 A 10 B 15 dtype: int64 A 10 C 16

	E 18 dtype: int64 A 10 C 16 E 18 dtype: int64
7	What do the keys and values in the dictionary represent in a Series? Answer: Keys become the index labels of the Series. Values become the data (the elements) of the Series.
8	What is a Pandas Series? Answer: A Pandas Series is a 1-D labelled array capable of holding data of any type (integers, strings, floats, Python objects). It has both data and an index to label each element. Once created we can't add or remove elements in original Series.
9	Can the data type in a Series be mixed? Answer: A Series holds elements of a single data type. If mixed types are provided, Pandas will pick a common data type (usually object/string) for all elements. Example: <pre>import pandas as pd s = pd.Series([10, "hello", 3.14, True]) print(s) print("Data type:", s.dtype)</pre>
10	How do we check for missing values in the Series? Answer: Use the <code>isnull()</code> method, which returns a Boolean Series indicating where values are missing. Also 'hasnans' attribute can be used which will return True or False depending on the use of NaN values in the series.

11	How can you sort a Series by its index or values? Answer: Index: <code><seriesobject>.sort_index()</code> Values: <code><seriesobject>.sort_values()</code>
12	What are the key features of a Pandas Series? How is it different from a NumPy array and a Python list? Answer: Key Features of a Pandas Series: ● One-dimensional labeled array. ● Supports different data types. ● Allows custom indexing. ● Supports vectorized operations. ● Handles missing data gracefully using NaN.

Comparison of List, ndarray and Series			
Feature	Python List	NumPy Array	Pandas Series
Data Type	Mixed	Homogeneous	Homogeneous
Indexing	Positional only	Positional only	Customizable labels

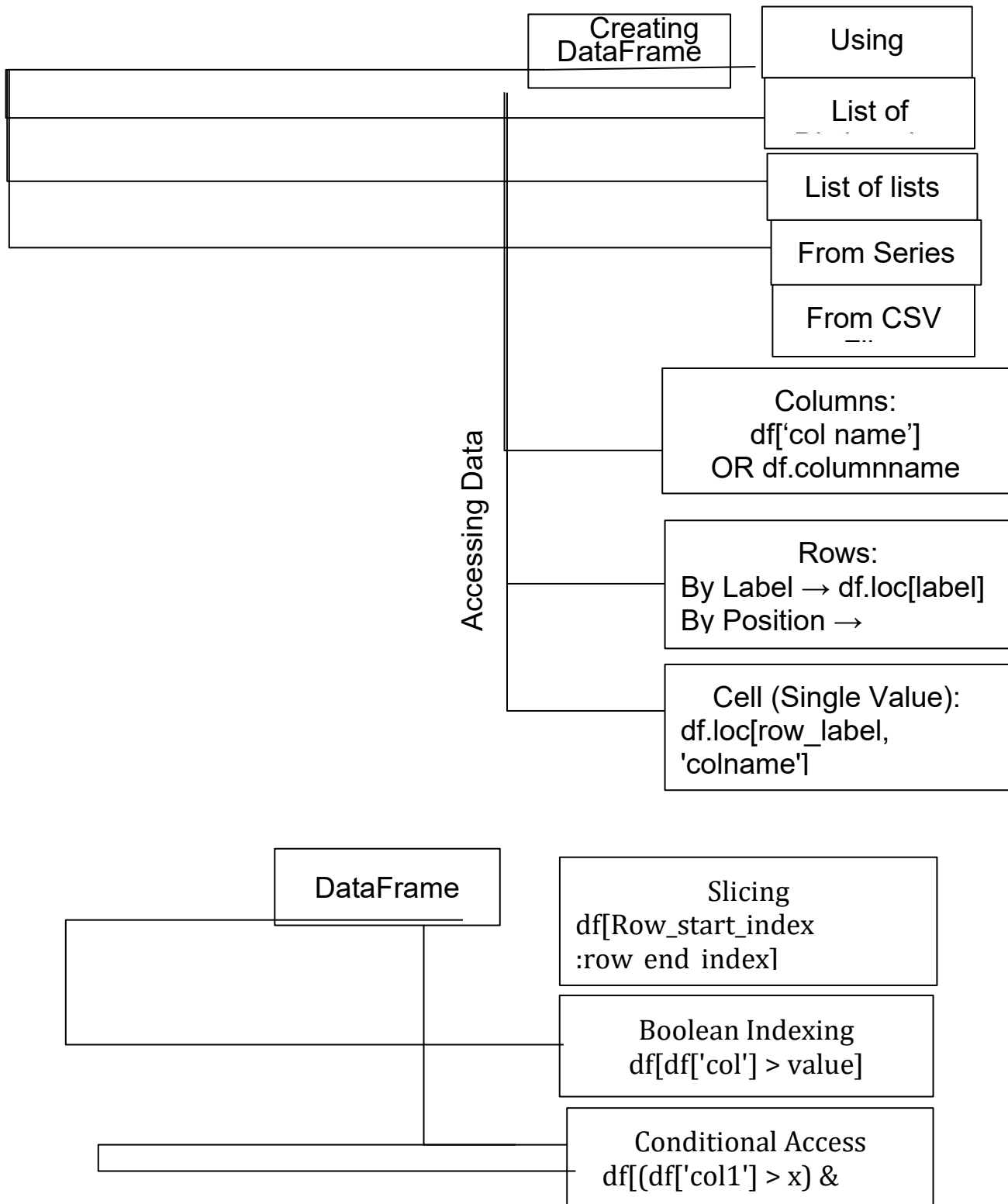
	Operations	Manual loop	Vectorized	Vectorized
	Missing Values	Manual handling	Limited support	Built-in NaN
	Library Dependency	None	numpy	Pandas
13	Give the output of the following: <pre>import pandas as pd S1=pd.Series([10,15,16,12,18,19], index=['A', 'B', 'C', 'D', 'E', 'F']) S2=pd.Series([2,3,2,4,5,3], index = ['A', 'B', 'C', 'D', 'F', 'G']) print(S1+S2)</pre> Answer: A 12.0 B 18.0 C 18.0 D 16.0 E NaN F 24.0 G NaN dtype: float64			
14	Case Based Question: Monthly Test Scores Analysis A CS teacher recorded the IP test scores of five students using a Pandas Series in Python. <pre>import pandas as pd marks = pd.Series([78, 85, 92, 67, 88], index=["Hari", "Priya", "Anshu", "Neha", "Sara"]) print(marks)</pre> output: <pre>Hari 78 Priya 85 Anshu 92 Neha 67 Sara 88 dtype: int64</pre> Questions 1. Name the library used to create the Series. 2. What is the index label of the student who scored 92 marks? 3. Write the command to display the marks of Neha. 4. Write the command to display only the students scoring more than 80 marks. 5. What will be the output of: print(marks.mean()) Answers 1. The library used is pandas. 2. The index label is Anshu. 3. Command: print(marks["Neha"]) 4. Command: print(marks[marks > 80]) 5. Output: 82.0			

15	Case-Based Question: Online Store Sales Data An online store recorded the number of mobile phones sold in different cities using a Pandas Series. <pre>import pandas as pd sales = pd.Series([120, 150, 90, 200], index=["Delhi", "Mumbai", "Chennai", "Kolkata"]) print(sales)</pre> Questions - How to display the total elements present in the given Series? - Write the python statement to sort the given series using values? Answers - print(sales.size) - print(sales.sort_values())
----	---

Assertion and Reasoning based Questions A: Assertion, R: Reason Choose the correct option: A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, but R is NOT the correct explanation of A. C. A is true, but R is false. D. A is false, but R is true.	
1	Assertion (A): A Pandas Series is fundamentally a two-dimensional labelled data structure. Reason (R): It contains both a row and index Answer: D. A is false, R is true
2	Assertion (A): When creating a Pandas Series from a NumPy array, the length of the index labels passed must match the size of the array to avoid a ValueError. Reason (R): If the lengths do not match, Pandas automatically fills the missing values with NaN to prevent errors Answer: C. A is true, R is false.
3	Assertion (A): The empty attribute of a Pandas Series returns True if the Series has no data values. Reason (R): This attribute is useful for quickly determining if a Series object has been initialized with any elements Answer: A. A is true, R is a correct explanation for A Explanation: The empty attribute prints True if the Series is empty and False otherwise. This attribute indeed serves to check whether a Series contains any values, making the reason a valid explanation for the assertion's purpose.
4	Assertion (A): In Pandas Series, positional indexing for slicing excludes the value at the end index position. Reason (R): This slicing behaviour is identical to how slicing with labeled indexes works, where the end label is also excluded. Answer: C. A is true, R is false.

Python DataFrame

Concept map: Creating DataFrame and accessing Data



Definition: A DataFrame is a data structure that organizes data into a 2-dimensional table of rows and columns. DataFrame helps us to store data in multiple columns.

Features: Two-dimensional, size mutable, value mutable, row index and column index.

Example: DataFrame to store details of some persons

	Name	Age	City
0	Alice	25	New York
1	Bob	30	Los Angeles
2	Charlie	35	Chicago

In the above DataFrame named **persons**, where 0,1,2 are row indexes or row labels and Name, Age, City are column indexes or column labels.

In each column of a DataFrame, we can have data of different types. It is possible to change the data of a column or row (add new rows, columns or remove the existing rows and columns)

Dataframes are created using the DataFrame() method of pandas.

Creating Dataframes:

Creation of DataFrame from Dictionary of Series

Creating a pandas DataFrame from a dictionary of Series is straightforward. Each key in the dictionary represents a column name, and the Series associated with that key provides the data for the column.

Program	Output
<pre>import pandas as pd name_series = pd.Series(['Alice', 'Bob', 'Charlie']) age_series = pd.Series([25, 30, 35]) city_series = pd.Series(['New York', 'Los Angeles', 'Chicago']) # Dictionary of Series data_dict = { 'Name': name_series, 'Age': age_series, 'City': city_series} # Creating DataFrame named df df = pd.DataFrame(data_dict) # Display the DataFrame print(df)</pre>	<pre> Name Age City 0 Alice 25 New York 1 Bob 30 Los Angeles 2 Charlie 35 Chicago</pre>

Key Points:

The keys of the dictionary ('Name', 'Age', 'City') become the column names of the DataFrame. Each Series provides data for its respective column.

Creating DataFrame using list of dictionaries:

Each dictionary in the list represents a row in the DataFrame, and the keys in the dictionaries become the column names.

Program	Output
<pre>import pandas as pd data = [{'Name': 'Alice', 'Age': 25, 'City': 'New York'}, {'Name': 'Bob', 'Age': 30, 'City': 'Los Angeles'}, {'Name': 'Charlie', 'Age': 35, 'City': 'Chicago'}]</pre>	<pre> Name Age City 0 Alice 25 New York 1 Bob 30 Los Angeles 2 Charlie 35 Chicago</pre>

```
{'Name': 'Charlie', 'Age': 35, 'City': 'Chicago'}]
# Creating DataFrame
df = pd.DataFrame(data)
# Display the DataFrame
print(df)
```

Key Points:

The keys in the dictionary ('Name', 'Age', 'City') become the column names of the DataFrame. Each dictionary represents one row, and its values are placed in the corresponding columns.

Creating Dataframe using Text/CSV Files:

CSV stands for **Comma-Separated Values**. A CSV file is a **plain text file** used to store **tabular data** (like rows and columns in a spreadsheet), where **each line represents a row**, and **each value (or field) is separated by a comma**.

The pandas library provides the **read_csv()** function to create a DataFrame using the given file. CSV files can be created using various applications.

Suppose we have a CSV file named **data.csv** with the following content:

```
Name, Age, City
Alice, 25, New York
Bob, 30, Los Angeles
Charlie, 35, Chicago
```

Program: create a dataframe using CSV File	Output			
import pandas as pd		Name	Age	City
# Load data from CSV file	0	Alice	25	New York
df = pd.read_csv('data.csv')	1	Bob	30	Los Angeles
# Display the DataFrame	2	Charlie	35	Chicago
print(df)				

Key Notes:

- The first row of the CSV file is automatically treated as column headers by default.
- You can specify a custom delimiter using the **sep** parameter, such as `read_csv('data.csv', sep=';')` if the file uses semicolons instead of commas.
- Additional options like skipping rows (**skiprows**), handling missing values (**na_values**), and specifying column data types (**dtype**) make the function highly versatile.

Accessing a column of a Dataframe:

Syntax: **<Dataframename>[index]**

<Dataframename>[[list of columns]]

Example: `print(df[ ' Marks' ])` # here df is the dataframe and **Marks** is a column

Adding a New Column:

We can add a new column to the DataFrame by directly assigning values. The new column can contain a fixed value, values calculated based on existing columns, or values from another source.

Consider the DataFrame '**Marks**' given below:

	Name	Eng	Maths
1	Ramu	25	29
2	Sonu	23	27
3	Rita	24	26

To add one more column IP with marks 28,27,29 we can write the following code
`Marks['IP'] = [28,27,29]`

Assigning values to a new column label that does not exist will create a new column at the end. If the column already exists in the DataFrame then the assignment statement will update the values.

We can also change data of an entire column to a particular value in a DataFrame. For example, the code `Marks['Eng'] = 30` will set the value 30 in all the rows of the DataFrame.

Adding new row to a Dataframe:

To add a new row, we can use the `.loc[ ]` method or the `append()` function. However, note that `append()` is being deprecated in newer versions of pandas, so `.loc[ ]` is preferred.

Adding row using `loc[ ]`:

Syntax: `<dataframe_name>.loc['row label'] = [list of values]`

Example: Consider the DataFrame, 'df', Given Below:

	Name	Eng	Maths	IP
0	Ramu	25	29	27
1	Sonu	23	27	24
2	Rita	24	26	26

Create above DataFrame using dictionary and then add a new row: `['dinesh',27,28,25]`

```
import pandas as pd
Marks = { 'Name': ['Ramu', 'Sonu', 'Rita'], 'English': [24, 25, 29], 'Math': [26, 23, 27],
          'IP': [27, 24, 26] }
df = pd.DataFrame(Marks)                # Create the DataFrame
print("before adding new row")
print(df)                               # Display the DataFrame
df.loc[3]=['dinesh',27,28,25]            # To add a new Row
print("after adding new row")
print(df)                                # Display the DataFrame after adding new row
```

OUTPUT:

before adding new row

	Name	English	Math	IP
0	Ramu	24	26	27
1	Sonu	25	23	24
2	Rita	29	27	26

after adding new row

	Name	English	Math	IP
0	Ramu	24	26	27
1	Sonu	25	23	24
2	Rita	29	27	26
3	dinesh	27	28	25

Note:

1. If the row label is already existing then it will update the row.
2. If we try to add a row with lesser values than the number of columns in the DataFrame, it results in a `ValueError`.

Deleting Rows or Columns from a DataFrame

We can use **drop()** method to delete rows and columns. This method needs the row label or column label and axis. For deleting row axis value is 0 and for column it is 1.

Syntax:

1. To delete a row :

`<dataframeaname> = <dataframeaname>.drop(<'rowlabel'>, axis=0)`

2. To delete a column :

`<dataframeaname> = <dataframeaname>.drop(<'columnlabel'>, axis=1)`

Example: to delete the row 'Sonu' from the above DataFrame, Marks, we can write:

Marks = Marks.drop(1, axis = 0)

Similarly, to delete the column, 'Name' we can write:

Marks= Marks.drop("Name", axis = 1)

To delete multiple columns, specify the list of columns instead of one column name.

Example:

Marks= Marks.drop(['Eng' , 'Math'], axis =1) will delete the columns, "Eng" and "Math".

Renaming Columns or Rows

Use the **rename()** method to rename rows and columns. For this a dictionary is used to specify the old names and their new names.

Syntax: Renaming columns

`<Dataframe_name>.rename(columns={'Oldname': 'New Name', 'Oldname': 'Newname'}, inplace=True)`

Example:

Marks.rename(columns = {'Eng': 'English', 'Math': 'Mathematics'}, inplace = True)

Syntax: Renaming rows

`<Dataframe_name>.rename(index={'Oldname': 'New Name', 'Oldname': 'Newname'}, inplace=True)`

Example:

df.rename(index={0: 'Row_1', 1: 'Row_2'}, inplace=True)

Here df is the dataframe, Row_1 is the new row label for the existing label 0.

Note: inplace=True: Modifies the DataFrame directly. If inplace=False: it will create a new changed DataFrame and the original DataFrame remains unchanged.

head() and tail() functions:

In a **pandas DataFrame**, the **head()** and **tail()** functions are used to quickly view the top or bottom rows of the data, which is especially helpful for large datasets.

head() Function

- **Purpose:** Displays the **first n rows** of the DataFrame.
- **Syntax:** **df.head(n)**

Default: If n is not specified, it shows the first **5 rows**.

Example:

```
import pandas as pd
df = pd.read_csv('data.csv')
print(df.head()) or print(df.head(5))    # First 5 rows
print(df.head(10))    # First 10 rows
```

tail() Function

- **Purpose:** Displays the **last n rows** of the DataFrame.
- **Syntax:** **df.tail(n)**

Default: If n is not specified, it shows the last **5 rows**.

Example:

```
print(df.tail()) or print(df.tail(5))      # Last 5 rows
print(df.tail(3))      # Last 3 rows
```

Why Use Them?

- Quick inspection of data.
- Useful in **data exploration, debugging, or checking format** after loading or transforming data.

Indexing using Labels in dataframe

Indexing using **labels** in a pandas DataFrame is done primarily with the **.loc[]** accessor/ indexer attributes. It's a very flexible way to select rows, columns, or both, using **row and column labels** (not numeric positions).

Accessing Rows:**1. Accessing Rows by Index Position (.iloc[])**

The **.iloc[]** allows you to access rows based on their integer index position (0-based indexing).

Syntax: <dataframename>.iloc[start : stop: step]

Examples:

1) Marks.iloc[0] will extract the first row.

2) Marks.iloc[0:3] will extract first, second and third rows (row 0, row 1 and row 2).

In the above example, index 3 is not included. Consider the rows with start index to stopindex-1

Accessing Rows by Labels (.loc[])

The **.loc[]** is used to access rows by labels (**index values**) or using conditions.

Access the row with label 1 from the DataFrame, df:

```
print(df.loc[1])
```

To access rows where Age is greater than 25 from the DataFrame df (Here 'Age' is a row label):

```
print(df.loc[df['Age'] > 25])
```

Accessing Rows with iterrows():

The **iterrows()** method allows us to iterate through rows as pairs of index and Series.

Example:

Consider the DataFrame, df

	Name	Age
0	Alice	25
1	Bob	30
2	Charlie	35

Code:

```
for index, row in df.iterrows():
```

```
    print(f'Index: {index}, Name: {row['Name']}, Age: {row['Age']}")
```

Output:

Index: 0, Name: Alice, Age: 25

Index: 1, Name: Bob, Age: 30

Index: 2, Name: Charlie, Age: 35

.loc[] – Indexing with Labels

Basic Syntax: `df.loc[row label, column label]`

can select:

- A single row/column
- Multiple rows/columns
- A range of rows/columns (inclusive)
- With conditions (Boolean indexing)

Examples

```
import pandas as pd
```

```
data = {
```

```
    'Name': ['Alice', 'Bob', 'Charlie'],
```

```
    'Age': [25, 30, 35],
```

```
    'City': ['NYC', 'LA', 'Chicago'] }
```

```
df = pd.DataFrame(data, index=['a', 'b', 'c'])
```

```
print(df)
```

OUTPUT:

	Name	Age	City
a	Alice	25	NYC
b	Bob	30	LA
c	Charlie	35	Chicago

1. Access a single row by label:	<code>print(df.loc['a'])</code>
2. Access a specific value:	<code>print(df.loc['b', 'City'])</code>
3. Access multiple rows and columns:	<code>print(df.loc[['a', 'c'], ['Name', 'Age']])</code>
4. Label-based slicing (inclusive):	<code>print(df.loc['a':'b'])</code> # Rows 'a' and 'b'
5. Conditional selection:	<code>print(df.loc[df['Age'] > 25])</code>

Comparison between Label-based indexing (.loc[]) and Position-based indexing (.iloc[])

Feature	.loc[]	.iloc[]
Type of indexing	Label-based	Position-based (integer)
Access by	Row/column names (labels)	Row/column index positions
Inclusive slicing	Yes (start to end)	No (like Python, end is exclusive)
Returns	DataFrame / Series / value	DataFrame / Series / value
Raises error if label not found	Yes	Yes
Examples Side-by-Side		
Task	.loc[]	.iloc[]
Get row 'a'	<code>df.loc['a']</code>	<code>df.iloc[0]</code>
Get value (row 'b', col 'City')	<code>df.loc['b', 'City']</code>	<code>df.iloc[1, 2]</code>
Get first two rows	<code>df.loc['a':'b']</code> # (inclusive)	<code>df.iloc[0:2]</code> # (exclusive)

Feature	.loc[]	.iloc[]
Get 'Name' and 'City' cols for all rows	df.loc[:, ['Name', 'City']]	df.iloc[:, [0, 2]]
Conditional selection	df.loc[df['Age'] > 25]	df.iloc[(df['Age'] > 25).values]

Pro Tips

- Use .loc[] when you **know the labels** or want to do **Boolean filtering**.
- Use .iloc[] when you **only care about positions** (like working with arrays).
- Both are very powerful — and you can even mix them smartly in functions!

Boolean Indexing in pandas

- Boolean indexing is a powerful way to filter rows or columns in a DataFrame using conditional logic. It returns only the rows (or columns) that meet the condition(s).

Basic Concept

df[condition]

The condition is a **Boolean Series** (True/False values) that is used to filter the DataFrame.

Example DataFrame:

```
import pandas as pd
```

```
data = {
```

```
    'Name': ['Alice', 'Bob', 'Charlie', 'David'],
```

```
    'Age': [25, 30, 35, 40],
```

```
    'City': ['NYC', 'LA', 'Chicago', 'Houston'] }
```

```
df = pd.DataFrame(data)
```

```
print(df)
```

Common Boolean Indexing Examples

1. Filter rows where age > 30 : `print(df[df['Age'] > 30])`
2. Multiple conditions (AND) : `print(df[(df['Age'] > 30) & (df['City'] == 'Chicago')])`
3. Multiple conditions (OR) : `print(df[(df['Age'] < 30) | (df['City'] == 'Houston')])`
4. Negation (NOT) : `print(df[~(df['City'] == 'LA')])`
5. Using .loc[] with condition : `print(df.loc[df['Age'] >= 35, ['Name', 'City']])`

Behind the Scenes

The condition inside `df[...]` creates a Boolean Series: `df['Age'] > 30`

The output of above expression is:

```
0  False
1  False
2   True
3   True
Name: Age, dtype: bool
```

Why Use Boolean Indexing?

- It's **concise** and **intuitive**.
- Helps with **data cleaning, exploration, and custom selections**.
- You can chain or combine multiple conditions for **complex filtering**.

Importing and Exporting Data between CSV Files and Dataframes

CSV Files: CSV stands for Comma Separated Values. A **CSV file** is a **plain text file** that contains **tabular data** (like a spreadsheet). **Each line** in the file is a **row** of data. **Columns** in each row are **separated(delimited)** by **commas (,)** by default. **Delimiters can also be specified by the user.** **CSVs don't support formatting (colors, fonts), unlike Excel files** The extension of such files will be **".csv"**, and are used for exchange data between applications.

Example of a CSV File: person.csv

Name,Age,Gender
Alice,30,Female
Bob,25,Male
Charlie,35,Male

Importing Data from CSV to DataFrame

pd.read_csv()

Above function reads a CSV file and loads it into a pandas DataFrame.

Syntax:

```
import pandas as pd  
df = pd.read_csv('<filename.csv>')
```

where 'pd' is just an **alias (shortcut name)** used to refer to the pandas module in the code.

Options:

- `sep=','` : Set delimiter (default is comma).
- `header=0` : Which row to use as header.
- `index_col=0` : Use a column as the index.
- `usecols=['Col1', 'Col2', ...]` : Load only specific columns.

Example: `df = pd.read_csv('data.csv', index_col=0)`

Exporting DataFrame to CSV

df.to_csv()

Above statement will **write (save the DataFrame)** to a CSV file.

Basic Syntax:

```
df.to_csv('new_file.csv')
```

Options:

- `index=False` : to skip the row indexes while writing a DataFrame in a csv file
- `columns=['Col1', 'Col2', ...]` : Export only selected columns.
- `sep='<delimiter>'` : Change delimiter if needed.

Example: `df.to_csv('filtered_data.csv', index=False)`

Example Workflow

If the csv file named students.csv contains the following data:

```
RollNo,Name,Age  
101,Ramu,16  
102,Sonu,19  
103,Rita,16  
104,Amit,20  
105,Neha,21
```

Then if we execute the following code:

```
import pandas as pd  
df = pd.read_csv('students.csv') # Read CSV  
filtered = df[df['Age'] > 18] # Filter data  
filtered.to_csv('adult_students.csv', index=False) # Save to new CSV
```

The new csv file data:

```
RollNo,Name,Age  
102,Sonu,19  
104,Amit,20  
105,Neha,21
```

Tips:

Use **na_values** to define missing values while reading:

```
pd.read_csv('data.csv', na_values = ['NA', '?'])
```

Note: We can also read/write **Excel, JSON, SQL**, etc. with pandas.

Examples:

1. Create a DataFrame named df by importing data from the CSV File name 'student.csv'

Answer:

```
import pandas as pd
df = pd.read_csv('student.csv')
```

Note: here 'df' will be created by using the data from the csv file named student.csv, first row will be used as column labels, and 0,1,2, 3...will be the index.

2. Save the data represented by the Dataframe, 'df', as a CSV file named 'student.csv', without index.

Answer: **df.to_csv('student.csv', index=False)**

3. Saving dataframe as CSV files without index and with a custom delimiter.

Answer: **df.to_csv('student.csv', sep=';', index=False)**

4. Saving only selected columns

Answer: **df.to_csv('student.csv', columns=['Name'], index=False)**

Exercises:

1. Consider the following csv file, student.csv and answer the questions that follow.

Roll,Name,Age,Mark,Grade

1,Shravan,15,99,A

2,Ruchi,15,98,A

3,Siddharth,14,95,B

- a) Create a DataFrame with header=0 and Roll as index

Answer:

```
import pandas as pd
df = pd.read_csv("student.csv", header=0, index_col=0)
```

OR

```
df = pd.read_csv('student.csv', index_col='Roll')
```

- b) Creating the DataFrame by using the second row as header and second column as index

Answer: **df = pd.read_csv("student.csv", header=1, index_col=1)**

- c) Give the output of

```
import pandas as pd
```

```
# Read the CSV file and use 'Roll' as index
```

```
df = pd.read_csv('student.csv', index_col='Roll')
```

```
# Display the DataFrame
```

```
print(df)
```

Answer:

	Name	Age	Mark	Grade
1	Shravan	15	99	A
2	Ruchi	15	98	A
3	Siddharth	14	95	B

- d) Give the output

```
import pandas as pd
```

```
# Reads the CSV file into a DataFrame
```

```
df = pd.read_csv('student.csv')
# Display the DataFrame
print(df)
```

Answer:

	Roll	Name	Age	Mark	Grade
0	1	Shravan	15	99	A
1	2	Ruchi	15	98	A
2	3	Siddharth	14	95	B

Note:

CSV Files can be accessed using different applications including notepad, and spreadsheet.

Advantages of CSV:

- Easy to read and edit.
- Supported by almost all software.
- Smaller file size.

Limitations:

- No support for complex data types.
- Can't handle formulas, formatting, or multiple sheets (unlike Excel).
- Problems with commas when data itself has commas.

Attributes of DataFrame Object

- i) Some common attributes related to DataFrame object are described below and are accessed using the syntax:

<DataFrame object>.<Attributename>

```
import pandas as pd
df=pd.DataFrame({"Name":["Hari", "Pawan"],"Age":[45,44]}, index=['a','b'])
print(df)
```

Output

	Name	Age
a	Hari	45
b	Pawan	44

Attribute	Description	OUTPUT
DataFrame.index	Returns row label of the DataFrame. Ex.: df.index	Index(['a', 'b'], dtype='object')
DataFrame.columns	Returns column label of the DataFrame. Ex.: df.columns	Index(['Name', 'Age'], dtype='object')
DataFrame.dtypes	Return data type of each column of DataFrame. Ex.: df.dtypes	Name object Age int64 dtype: object
DataFrame.values	Returns numpy ndarray having all the values in the DataFrame, without the axis's labels. Ex.: df.values	[['Hari' 45] ['Pawan' 44]]
DataFrame.shape	Returns a tuple representing the dimensionality of the DataFrame EX: df.shape	(2, 2)

DataFrame.size	Returns no. of elements in the DataFrame object. Ex. df.size	4									
DataFrame.T	Returns transpose of the DataFrame. Means, row indices and column labels of the DataFrame replace each other's position. Ex: df.T	<table> <tr> <td></td><td>a</td><td>b</td></tr> <tr> <td>Name</td><td>Hari</td><td>Pawan</td></tr> <tr> <td>Age</td><td>45</td><td>44</td></tr> </table>		a	b	Name	Hari	Pawan	Age	45	44
	a	b									
Name	Hari	Pawan									
Age	45	44									
DataFrame.ndim	Returns dimension (no. of axis) Ex.: df.ndim	2									
DataFrame.empty	Returns true if DataFrame object is empty. Ex. df.empty	False									
DataFrame.name	Return or assign new name to DataFrame. Ex. df.name= 'Teacher' print(df.name)	Teacher									

Multiple Choice Questions with Answers

1	What is the primary characteristic of a Pandas DataFrame? A) A one-dimensional array containing a sequence of values B) A collection of built-in Python modules for various actions C) A two-dimensional labeled data structure, similar to a spreadsheet, with both row and column indices D) A package used for numerical data analysis that works with homogeneous multidimensional arrays Answer: C
2	How do Pandas DataFrames handle data types compare to NumPy arrays? A) Both NumPy arrays and Pandas DataFrames require homogeneous data types B) A NumPy array can have different data types, while a Pandas DataFrame requires homogeneous data C) A Pandas DataFrame can contain different data types (e.g., float, int, string, datetime) in its columns, whereas a NumPy array requires homogeneous data D) Pandas DataFrames only store numerical data, while NumPy arrays can store any data type. Answer: C
3	When creating a DataFrame from a dictionary of lists (e.g., dictForest = {'State': ['Assam'], 'GArea': [12345]}), what typically becomes the column labels in the resulting DataFrame? A) The list values become the column labels. B) Numeric indices are assigned as column labels by default. C) The dictionary keys ('State', 'GArea') become the column labels D) The dictionary values become the row labels. Answer: C
4	If you assign values to a column label that does not currently exist in a DataFrame (e.g., ResultDF['NewColumn'] = [val1, val2, val3]), what happens? A) A ValueError is raised because the column doesn't exist. B) The assignment statement will update the values of an already existing column C) A new column with that label is created at the end of the DataFrame D) The DataFrame is converted into a Series. Answer: C

5	What is the behavior of DataFrame.loc[] when used to add a new row to a DataFrame with an index label that already exists? A) A new row is added, creating a duplicate index label. B) A KeyError is raised because duplicate index values are not allowed for rows. C) The existing row with that index label will be updated with the new data D) The operation fails silently, and no changes are made. Answer: C
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6	What will be the output of pd.DataFrame([1, 2, 3])? A) A DataFrame with one column and three rows B) An error C) A DataFrame with three columns and one row D) A Series Answer: A) A DataFrame with one column and three rows
7	Which parameter is used to set custom row labels when creating a DataFrame? A) columns B) index C) labels D) rows Answer: B) index
8	You have the following dictionary: data = {'A': [1, 2], 'B': [3, 4]}. How many rows will the resulting DataFrame have when this dictionary is used to create a DataFrame? A) 1 B) 2 C) 3 D) 4 Answer: B) 2
9	What is the default value of the index parameter when creating a DataFrame? A) None B) RangeIndex starting from 0 C) Empty list D) Depends on the data Answer: B) RangeIndex starting from 0
10	What happens if the lists in a dictionary used to create a DataFrame are of different lengths? A) It fills missing values with zeros B) It fills missing values with NaN C) It raises a ValueError D) It aligns the shorter list to the left Answer: C) It raises a ValueError
11	Which of the following can NOT be used to create a DataFrame? A) Dictionary of lists B) List of tuples C) Single scalar value without specifying index and columns. D) NumPy array Answer: C) Single scalar value without specifying index and columns.

12	To set custom column names in a DataFrame created from a list of lists, which parameter is used? A) headers B) columns C) colnames D) labels Answer: B) columns
13	What will pd.DataFrame(np.array([[1, 2], [3, 4]]), columns=['X', 'Y']) create? A) A DataFrame with 2 rows and 2 columns named 'X' and 'Y' B) A DataFrame with 2 columns and default index C) A Series D) An error due to shape mismatch

	Answer: A) A DataFrame with 2 rows and 2 columns named 'X' and 'Y'
14	Give the output of the following code: <pre>import pandas as pd df = pd.DataFrame({'A': [1, 2], 'B': [3, 4]}) print(df.shape)</pre> A) (2, 2) B) (2, 1) C) (1, 2) D) (4,) Answer: A) (2, 2)
15	What will be the output? <pre>import pandas as pd data = {'Name': ['John', 'Alice'], 'Age': [25, 30]} df = pd.DataFrame(data) print(df['Name'][1])</pre> A) John B) Alice C) 25 D) Error Answer: B) Alice
16	What does this code do? <pre>import pandas as pd df = pd.DataFrame([[1, 2], [3, 4]], columns=['X', 'Y'], index=['a', 'b']) print(df.loc['a', 'Y'])</pre> A) 1 B) 2 C) 4 D) Error Answer: B) 2

17	What is the type of df in the following code? <pre>import pandas as pd df = pd.DataFrame({'a': 1, 'b': 2}, {'a': 3, 'b': 4})</pre> A) Series B) DataFrame C) Dictionary D) List Answer: B) DataFrame
18	What will be printed by this code? <pre>import pandas as pd import numpy as np df = pd.DataFrame(np.zeros((2,3))) print(df)</pre> A) DataFrame filled with NaNs B) DataFrame filled with 0.0 C) Error D) DataFrame filled with None Answer: B) DataFrame filled with 0.0
19	Choose the correct output: <pre>import pandas as pd df = pd.DataFrame({'x': [1, 2], 'y': [3, 4]}, index=['a', 'b']) print(df.index.tolist())</pre> A) ['x', 'y'] B) ['a', 'b'] C) [0, 1] D) ['1', '2'] Answer: B) ['a', 'b']
20	What does this code return? <pre>import pandas as pd df = pd.DataFrame({'A': [10], 'B': [20]}) print(df.values)</pre>

	A) <code>[[10, 20]]</code> Answer: A) <code>[[10, 20]]</code>	B) <code>[10, 20]</code>	C) <code>(10, 20)</code>	D) <code>[[10][20]]</code>																
21	What will be the output of the following code? <code>import pandas as pd</code> <code>df = pd.DataFrame({'A': [1, 2], 'B': [3]})</code> <code>print(df)</code> A) A DataFrame with NaN in missing values B) A DataFrame with zeros in missing values C) An error due to unequal list lengths D) A DataFrame with truncated data Answer: C) An error due to unequal list lengths																			
22	What will be the output of this code? <code>import pandas as pd</code> <code>df = pd.DataFrame({'A': [10, 20, 30, 40]})</code> <code>print(df[1:3])</code> <table border="1"><tr><td>A) A</td><td>B) A</td><td>C) A</td><td>D) Error</td></tr><tr><td>1 20</td><td>2 30</td><td>1 20</td><td></td></tr><tr><td>2 30</td><td>3 40</td><td>2 30</td><td></td></tr><tr><td></td><td></td><td>3 40</td><td></td></tr></table> Answer: A				A) A	B) A	C) A	D) Error	1 20	2 30	1 20		2 30	3 40	2 30				3 40	
A) A	B) A	C) A	D) Error																	
1 20	2 30	1 20																		
2 30	3 40	2 30																		
		3 40																		
23	What does this slicing return? <code>import pandas as pd</code> <code>df = pd.DataFrame({'x': [5, 10, 15, 20]})</code> <code>print(df.iloc[::2])</code> A) Rows at even indices B) Rows at odd indices C) First two rows D) Last two rows Answer: A) Rows at even indices																			
24	What will be the output of the following code? <code>import pandas as pd</code> <code>df = pd.DataFrame({'A': [1,2,3,4]})</code> <code>print(df.loc[0:2])</code> A) Rows with index 0, 1 B) Rows with index 0, 1, 2 C) Error D) Rows with index 1, 2, 3 Answer: B) Rows with index 0, 1,2																			
25	What will happen when we execute the below code? <code>import pandas as pd</code> <code>df = pd.DataFrame({'A': [100, 200, 300, 400]})</code> <code>print(df.iloc[-2:])</code> A) Prints last two rows B) Prints first two rows C) Error D) Prints nothing Answer: A) Prints last two rows																			
26	In pandas, .loc and .iloc are: A) Methods used for selecting data																			

B) Functions used for slicing data
C) Attributes/indexers used for selecting data
D) constants used for storing rows
Answer: C) Attributes/indexers used for selecting data

Short Answer Questions

- 1 Write code to create the following DataFrame 'profit' regarding the profit made by four companies, A, B, C, D in 2021,2022,2023,2024. Data given is in millions. Use years as the index.

Dataframe: profit

	A	B	C	D
2021	10	8	10	6
2022	12	9	10	12
2023	10	11	11	14
2024	14	12	12	16

Answer:

```
import pandas as pd
data = { 'A':{2021:10, 2022:12, 2023:10, 2024:14}, \
        'B':{2021:8, 2022:9, 2023:11, 2024:12}, \
        'C':{2021:10, 2022:10, 2023:11, 2024:12}, \
        'D':{2021:6, 2022:12, 2023:14, 2024:16}
        }
profit = pd.DataFrame(data)
print(profit)
```

- 2 Give the output of the following code:
- ```
import pandas as pd
data = {2021: {'A':10, 'B':12, 'C':10, 'D':14},
 2022: {'A':8, 'B':9, 'C':11, 'D':12},
 2023: {'A':10, 'B':10, 'C':11, 'D':12},
 2024: {'A':6, 'B':12, 'C':14, 'D':16} }
profit = pd.DataFrame(data)
print(profit)
```

**Answer:**

|   | 2021 | 2022 | 2023 | 2024 |
|---|------|------|------|------|
| A | 10   | 8    | 10   | 6    |
| B | 12   | 9    | 10   | 12   |
| C | 10   | 11   | 11   | 14   |
| D | 14   | 12   | 12   | 16   |

| 3      | <p>Give the output of the following code:</p> <pre>import pandas as pd df=pd.DataFrame(['Apple','Banana','Orange','Grapes','Guava']) print(df[2:4:2])</pre> <p><b>Answer:</b></p> <pre>0 2  Orange</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |        |       |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|------|--|-------|----|-------|---|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|-------|--------|-------|
| 4      | <p>Consider the following code and answer the questions that follow</p> <pre>import pandas as pd data = {2021: {'A':10, 'B':12, 'C':10, 'D':14},         2022: {'A':8, 'B':9, 'C':11, 'D':12},         2023: {'A':10, 'B':10, 'C':11, 'D':12},         2024: {'A':6, 'B':12, 'C':14, 'D':16} } profit = pd.DataFrame(data)</pre> <p>i)print(<b>profit.head(2)</b>)<br/>ii)print(<b>profit.tail(2)</b>)<br/>iii)print(<b>profit['A']</b>)</p> <p><b>Answers:</b></p> <p><b>i)    2021   2022   2023   2024</b><br/><b>A    10       8       10       6</b><br/><b>B    12       9       10       12</b></p> <p><b>ii)    2021   2022   2023   2024</b><br/><b>C    10       11       11       14</b><br/><b>D    14       12       12       16</b></p> <p><b>iii) KeyError: 'A'</b><br/><b>Note:</b> To access row 'A', use .loc[]:</p> <pre>print(profit.loc['A'])</pre> <p>Then the output will be:</p> <pre>2021   10 2022   8 2023   10 2024   6 Name: A, dtype: int64</pre> |        |       |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
| 5      | <p>Shobit needs to create a dataframe named ‘mydata’ from two series named ‘Eng’ and ‘Math’(as given below). Help him to write the code:</p> <table><tr><th colspan="2">Eng</th><th colspan="2">Math</th></tr><tr><td>Aditi</td><td>25</td><td>Aditi</td><td>9</td></tr><tr><td>bhavuk</td><td>21</td><td>bhavuk</td><td>29</td></tr><tr><td>chirag</td><td>23</td><td>chirag</td><td>15</td></tr><tr><td>deepak</td><td>24</td><td>deepak</td><td>14</td></tr><tr><td>Gaurav</td><td>27</td><td>Gaurav</td><td>20</td></tr><tr><td>dtype:</td><td>int64</td><td>dtype:</td><td>int64</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                         | Eng    |       | Math |  | Aditi | 25 | Aditi | 9 | bhavuk | 21 | bhavuk | 29 | chirag | 23 | chirag | 15 | deepak | 24 | deepak | 14 | Gaurav | 27 | Gaurav | 20 | dtype: | int64 | dtype: | int64 |
| Eng    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Math   |       |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
| Aditi  | 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Aditi  | 9     |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
| bhavuk | 21                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | bhavuk | 29    |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
| chirag | 23                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | chirag | 15    |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
| deepak | 24                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | deepak | 14    |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
| Gaurav | 27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Gaurav | 20    |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |
| dtype: | int64                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | dtype: | int64 |      |  |       |    |       |   |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |    |        |       |        |       |

|   | <p><b>Answer:</b></p> <pre>import pandas as pd Eng = pd.Series([25,21,23,24,27]) Math = pd.Series([9,29,15,14,20]) mydata = pd.DataFrame({'Eng': Eng, 'Math': Math}) print(mydata)</pre> <p>output:</p> <table><tr><th></th><th>Eng</th><th>Math</th></tr><tr><td>0</td><td>60</td><td>70</td></tr><tr><td>1</td><td>75</td><td>85</td></tr><tr><td>2</td><td>88</td><td>90</td></tr><tr><td>3</td><td>92</td><td>88</td></tr><tr><td>4</td><td>70</td><td>78</td></tr></table>                                                                                                                                                                                                                                                                                                                                 |           | Eng    | Math  | 0   | 60    | 70 | 1 | 75  | 85 | 2   | 88 | 90 | 3      | 92 | 88 | 4 | 70 | 78     |    |    |   |   |       |    |    |   |   |           |    |    |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------|-------|-----|-------|----|---|-----|----|-----|----|----|--------|----|----|---|----|--------|----|----|---|---|-------|----|----|---|---|-----------|----|----|
|   | Eng                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Math      |        |       |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 0 | 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 70        |        |       |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 1 | 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 85        |        |       |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 2 | 88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 90        |        |       |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 3 | 92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 88        |        |       |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 4 | 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 78        |        |       |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 6 | <p><b>Carefully observe the following code and find the output:</b></p> <pre>import pandas as pd product={'prodid':pd.Series([1,2,3,4,5]),         'pname':pd.Series(['pen', 'pencil', 'eraser', 'color', 'sharpener']),         'qty':pd.Series([2,10,10,30,10]), 'price':pd.Series([300,20,50,40,15])} stock=pd.DataFrame(product) print(stock)</pre> <p><b>Answer:</b></p> <table><tr><th></th><th>prodid</th><th>pname</th><th>qty</th><th>price</th></tr><tr><td>0</td><td>1</td><td>pen</td><td>2</td><td>300</td></tr><tr><td>1</td><td>2</td><td>pencil</td><td>10</td><td>20</td></tr><tr><td>2</td><td>3</td><td>eraser</td><td>10</td><td>50</td></tr><tr><td>3</td><td>4</td><td>color</td><td>30</td><td>40</td></tr><tr><td>4</td><td>5</td><td>sharpener</td><td>10</td><td>15</td></tr></table> |           | prodid | pname | qty | price | 0  | 1 | pen | 2  | 300 | 1  | 2  | pencil | 10 | 20 | 2 | 3  | eraser | 10 | 50 | 3 | 4 | color | 30 | 40 | 4 | 5 | sharpener | 10 | 15 |
|   | prodid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | pname     | qty    | price |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 0 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | pen       | 2      | 300   |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 1 | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | pencil    | 10     | 20    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 2 | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | eraser    | 10     | 50    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 3 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | color     | 30     | 40    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 4 | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | sharpener | 10     | 15    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 7 | <p><b>Consider the following dataframe, product, answer the following questions:</b></p> <table><tr><th></th><th>prodid</th><th>pname</th><th>qty</th><th>price</th></tr><tr><td>0</td><td>1</td><td>pen</td><td>2</td><td>300</td></tr><tr><td>1</td><td>2</td><td>pencil</td><td>10</td><td>20</td></tr><tr><td>2</td><td>3</td><td>eraser</td><td>10</td><td>50</td></tr><tr><td>3</td><td>4</td><td>color</td><td>30</td><td>40</td></tr><tr><td>4</td><td>5</td><td>sharpener</td><td>10</td><td>15</td></tr></table> <p>a) Write python code to display the names of products.<br/>b) Write the python code to rename the column 'price' as 'newprice'</p> <p><b>Answer:</b></p> <p>a) <code>product['pname']</code><br/>b) <code>product.rename(columns={'price':'newprice'},inplace=True)</code></p>    |           | prodid | pname | qty | price | 0  | 1 | pen | 2  | 300 | 1  | 2  | pencil | 10 | 20 | 2 | 3  | eraser | 10 | 50 | 3 | 4 | color | 30 | 40 | 4 | 5 | sharpener | 10 | 15 |
|   | prodid                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | pname     | qty    | price |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 0 | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | pen       | 2      | 300   |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 1 | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | pencil    | 10     | 20    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 2 | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | eraser    | 10     | 50    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 3 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | color     | 30     | 40    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |
| 4 | 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | sharpener | 10     | 15    |     |       |    |   |     |    |     |    |    |        |    |    |   |    |        |    |    |   |   |       |    |    |   |   |           |    |    |

8

Consider the given DataFrame 'result' :

|   | Name   | Percentile |
|---|--------|------------|
| 0 | Rohit  | 95         |
| 1 | Mohit  | 76         |
| 2 | Raman  | 98         |
| 3 | Aditya | 47         |

Write the suitable Python statements for the following:  
i)Add new column, 'grade' having values 'A', 'B', 'A', 'B'  
ii)Add a new row with name 'Arpit', Percentile 92 and grade 'A'  
iii)Display the Percentile of 'Rohit'

Answer:

i)result['Grade']=[ 'A', 'B', 'A', 'B']  
ii)result.loc[ 5 ] = ['Arpit', 92, 'A']  
iii)result.loc[result['Name']=='Rohit', 'Percentile']

9

Consider the following DataFrame 'employee':

| EID | EName   | Department | Salary |
|-----|---------|------------|--------|
| 1   | John    | IT         | 50000  |
| 2   | Ria     | MKT        | 45000  |
| 3   | Shobhit | IT         | 55000  |
| 4   | Aditya  | MKT        | 60000  |
| 5   | Rashi   | ADMIN      | 52000  |

Write the suitable Python statements for the following:  
i)Remove the column 'Salary'  
ii)Remove the row having index 4  
iii)Save the dataframe to a CSV file, data.csv in D:\Data  
iv)Increase the salary by 5000 for all employees

Answer:

i) employee.drop('Salary', axis=1, inplace=True)  
ii)employee.drop(4, axis=0, inplace=True)  
iii)employee.to\_csv("D:\\Data\\data.csv")  
iv)employee['salary'] = employee['salary'] + 5000

## Assertion and Reasoning based Question

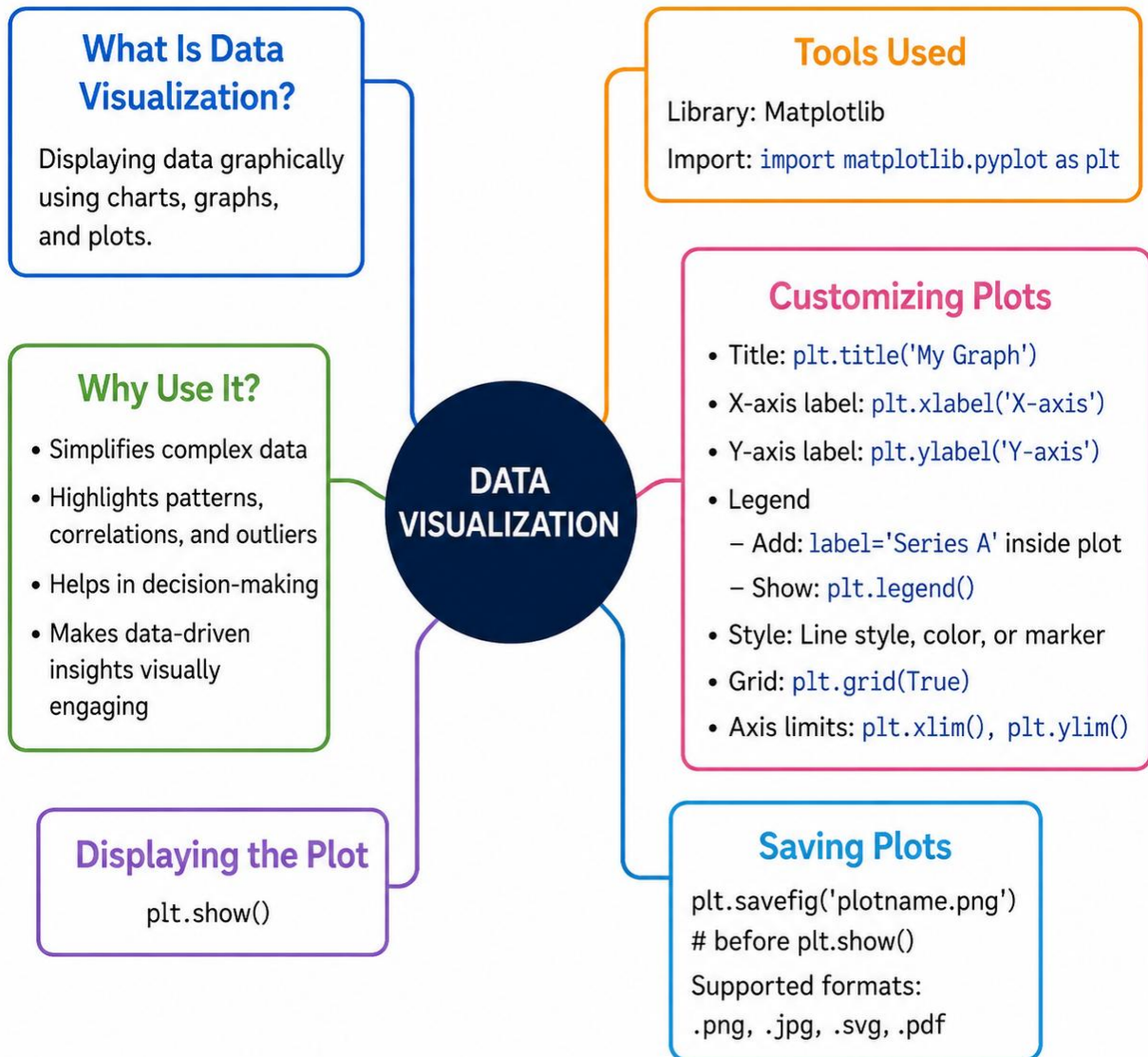
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Directions</b><br/> In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:<br/> (A) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).<br/> (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).<br/> (C) Assertion (A) is true, but Reason (R) is false.<br/> (D) Assertion (A) is false, but Reason (R) is true.</p> |                                                                                                                                                                                                                                                             |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p><b>Assertion (A):</b> A DataFrame is a two-dimensional labeled array. Its columns can have heterogeneous types, i.e., they can hold varying types of data.<br/> <b>Reason (R):</b> We need a DataFrame with a Boolean index to use Boolean indexing.</p> |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <p><b>Answer: (C) Assertion (A) is true, but Reason (R) is false.</b></p> <p><b>Explanation:</b></p> <p><b>Assertion (A):</b> True. A DataFrame is indeed a two-dimensional, labeled data structure in pandas. Its columns can have different data types, such as integers, strings, floats, etc. This makes DataFrames highly versatile for handling structured data.</p> <p><b>Reason (R):</b> False. Boolean indexing does not require the DataFrame to have a Boolean index. Instead, it is a technique for filtering data using Boolean conditions (i.e., True/False values) applied to the DataFrame's rows or columns.</p>                                                                                                                                                                             |
| 2 | <p><b>Assertion (A):</b> Iteration is a general term for taking each item of something one after another.</p> <p><b>Reason (R):</b> <code>itertuples()</code> returns the iterator yielding each index value along with a series containing the data in each row.</p> <p><b>Answer: C) Assertion (A) is true, but Reason (R) is false.</b></p> <p><b>Explanation: Assertion (A) is true,</b> Iteration means accessing or processing elements one by one in a sequence or collection.</p> <p><b>Reason (R) is false,</b> <code>itertuples()</code> returns named tuples for each row, while <code>iterrows()</code> returns the index and a Series for each row.</p>                                                                                                                                          |
| 3 | <p><b>Assertion (A):</b> Indexing can also be known as subselection.</p> <p><b>Reason (R):</b> Pandas DataFrame. <code>loc</code> attribute accesses groups of rows and columns by label(s) or a Boolean array in the given DataFrame.</p> <p><b>Answer: (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 4 | <p><b>Assertion (A):</b> To delete a column from a pandas DataFrame, <code>drop()</code> method is used.</p> <p><b>Reason (R):</b> Columns are deleted by dropping columns with index labels.</p> <p><b>Answer: (C) Assertion (A) is true, but Reason (R) is false.</b></p> <p><b>Explanation:</b></p> <p><b>Assertion (A):</b> True. The <code>drop()</code> method is indeed used to delete a column from a pandas DataFrame. It allows the removal of one or more columns by specifying their names.</p> <p><b>Reason (R):</b> False. Columns are not deleted by using <b>index labels</b>; instead, they are deleted by specifying <b>column labels</b> (i.e., the names of the columns). The <code>drop()</code> method with <code>axis=1</code> is used to indicate that a column is being dropped.</p> |
| 5 | <p><b>Assertion (A):</b> Rows can also be selected by passing integer location.</p> <p><b>Reason (R):</b> Integer location can be passed to the <code>.iloc[]</code> method.</p> <p><b>Answer: (A) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).</b></p> <p><b>Explanation</b></p> <p><b>Assertion (A):</b> True. Rows can indeed be selected by passing integer locations, which refers to their positional index in the DataFrame.</p> <p><b>Reason (R):</b> True. The <code>.iloc[]</code> method is specifically designed for positional indexing, allowing you to select rows and columns using integer-based location indices.</p>                                                                                                            |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | <p><b>Assertion (A):</b> The head( ) function returns the first <math>n</math> rows from the object based on position.</p> <p><b>Reason (R):</b> <math>n</math> is the selected number of rows whose default value is 3.</p> <p><b>Answer: (C) Assertion (A) is true, but Reason (R) is false.</b></p> <p><b>Explanation:</b></p> <p><b>Assertion (A):</b> True. The head() function in pandas does indeed return the first <math>n</math> rows of a DataFrame or Series based on their position.</p> <p><b>Reason (R):</b> False. The default value of <math>n</math> for the head() function is 5, not 3.</p>                                                                                                                                         |
| 7 | <p><b>Assertion (A):</b> A list of dictionaries can be passed to form a DataFrame.</p> <p><b>Reason (R):</b> Keys of the dictionary are taken as row names by default.</p> <p><b>Answer: (C) Assertion (A) is true, but Reason (R) is false.</b></p> <p><b>Explanation:</b></p> <p><b>Assertion (A):</b> True. A list of dictionaries can indeed be passed to pandas to form a DataFrame. Each dictionary in the list represents a row in the DataFrame, and the keys of the dictionary become column names.</p> <p><b>Reason (R):</b> False. Keys of the dictionary are not taken as row names by default. Instead, they are used as column names, while the row indices are assigned automatically (starting from 0) unless explicitly specified.</p> |
| 8 | <p><b>Assertion (A):</b> The .loc[] method in pandas is used to access rows and columns using labels.</p> <p><b>Reason (R):</b> The .iloc[] method accesses rows and columns using integer index positions.</p> <p><b>Answer : (B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).</b></p> <p><b>Explanation:</b> .loc[] is a label-based indexing method. It selects data using row names and column names. .iloc[] is an integer position-based indexing method. It selects data using numerical row and column positions. Although both statements are correct, the Reason does not explain why .loc[] works with labels; it only states the function of .iloc[]</p>                     |

# DATA VISUALIZATION

## Concept Map



Data Visualization is the graphical representation of information and data using visual elements like charts, graphs, and plots.

- Helps in understanding large data sets quickly
- Makes analysis easier by identifying trends and patterns

Popular Python Libraries for Visualization:

- matplotlib – Basic plotting library
- pylab – Combined interface of matplotlib + numpy (less common now)
- seaborn – Built on matplotlib (used for attractive statistical plots)

## Types of Charts in matplotlib:

| Chart Type | Description                           | Function   |
|------------|---------------------------------------|------------|
| Line Chart | Shows trends over time or sequence    | plt.plot() |
| Bar Chart  | Displays data in rectangular bars     | plt.bar()  |
| Histogram  | Shows distribution of continuous data | plt.hist() |

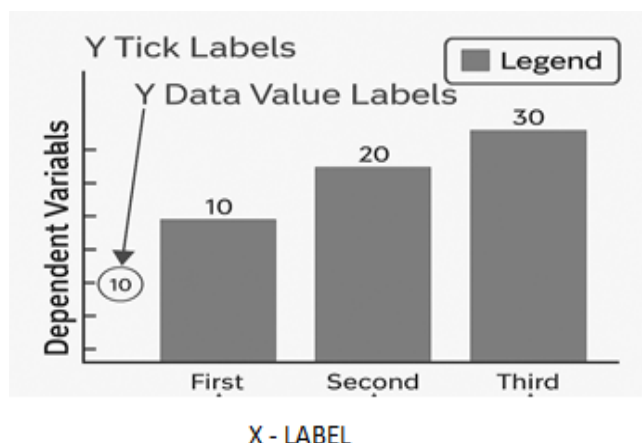
## Basic Plotting Commands:

import matplotlib.pyplot as plt

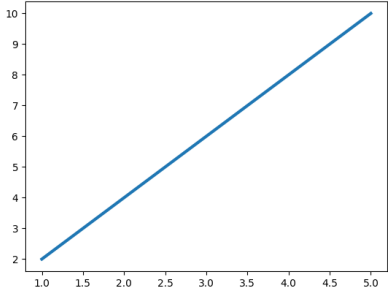
- plt.plot(x, y) – Line plot
- plt.bar(x, y) – Bar chart
- plt.hist(data) – Histogram
- plt.show() – Displays the plot
- plt.xlabel(), plt.ylabel(), plt.title() – Labeling the chart

## Customizing Graphs:

- Color: color='red'
- Line style: linestyle='--'
- Marker: marker='o'
- Legends: plt.legend(['Line1', 'Line2'])



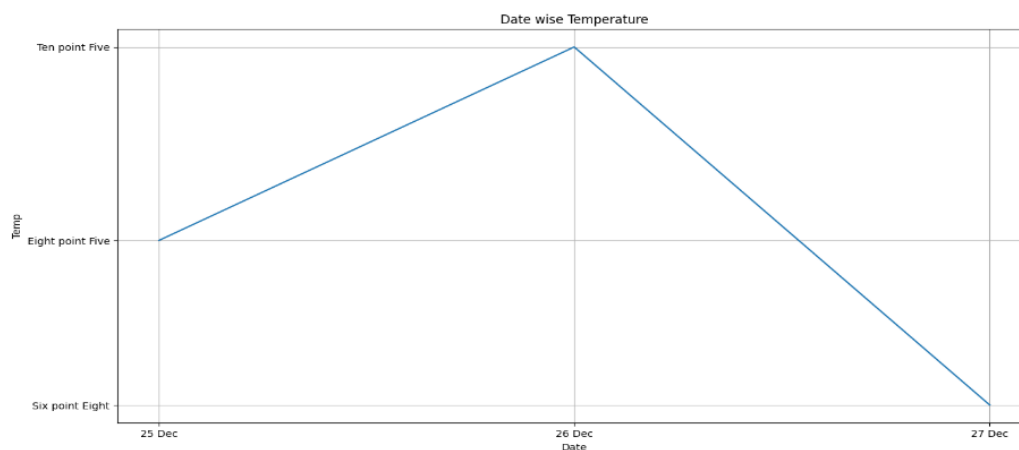
| Requirement                                                                                                                        | Python Statement/library                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| The library used for creating static, animated, and interactive 2D- plots or figures in Python                                     | matplotlib                                                                                      |
| import statement for including the matplotlib library in the Python program.                                                       | import matplotlib.pyplot as plt<br>plt is an alias or an alternative name for matplotlib.pyplot |
| Function to create (plot) charts                                                                                                   | plt.plot(x,y). where x and y are the coordinates                                                |
| Function to show the chart                                                                                                         | plt.show()                                                                                      |
| <b>Line Chart:</b> It displays the information as a series of points called 'markers'. All markers are connected by line segments. |                                                                                                 |
| <b>Sample program</b>                                                                                                              | <b>OUTPUT</b>                                                                                   |

|                                                                                                                                                                                                                 |                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <pre>import matplotlib.pyplot as plt import numpy as np a=[1,2,3,4,5] b=np.array(a)*2 plt.plot(a,b) plt.show()</pre> <p><b>a</b> and <b>b</b> are collection of values of list or tuple or array or series.</p> |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|

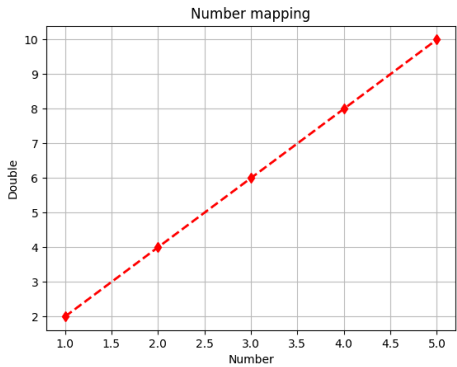
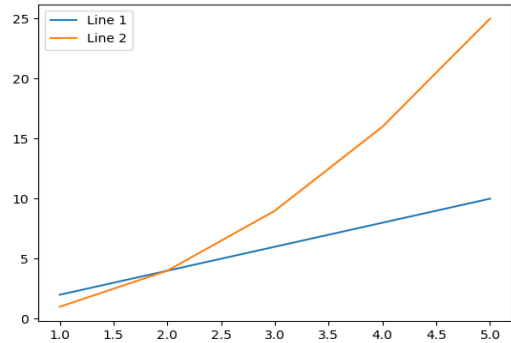
## Customization of Plots

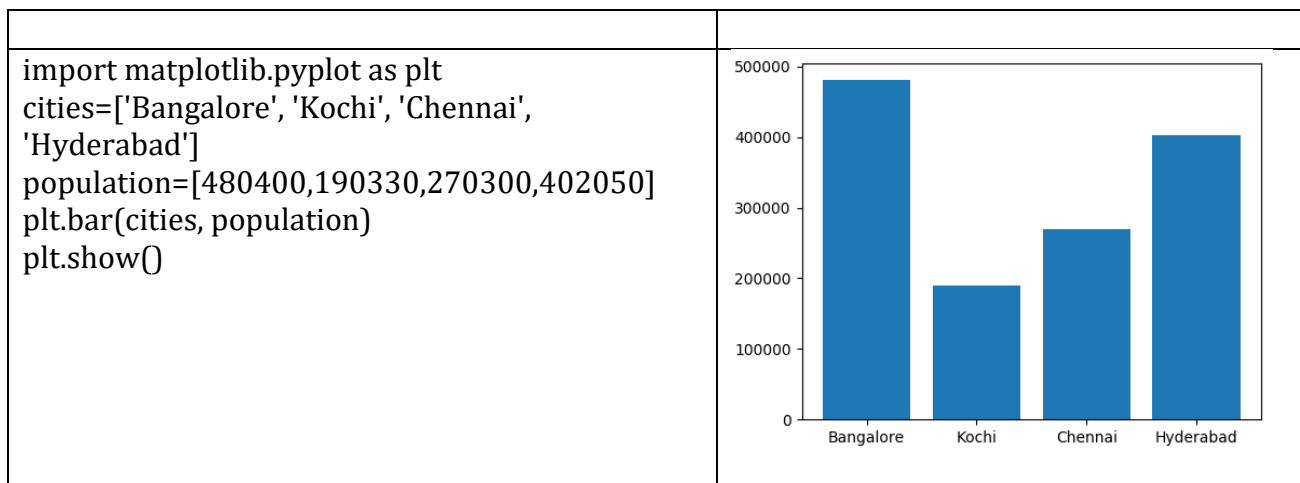
**pyplot** library gives us numerous functions, which can be used to customize charts such as adding titles or legends.

|                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pre>import matplotlib.pyplot as plt date=["25/12","26/12","27/12"] temp=[8.5,10.5,6.8] plt.plot(date, temp) plt.xlabel("Date") plt.ylabel("Temp") plt.title("Date wise Temperature") plt.grid(True) plt.xticks(date,["25 Dec","26 Dec","27 Dec"]) plt.yticks(temp,["Eight point Five","Ten point Five","Six point Eight"]) plt.show()</pre> | <pre>plt.xlabel() #add the Label on x-axis plt.ylabel() #add the Label on y-axis plt.title() #add the title to the chart plt.grid() #add gridlines to the background plt.xticks() # set the locations of the ticks on the x-axis plt.yticks() # set the locations of the ticks on the y-axis</pre> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

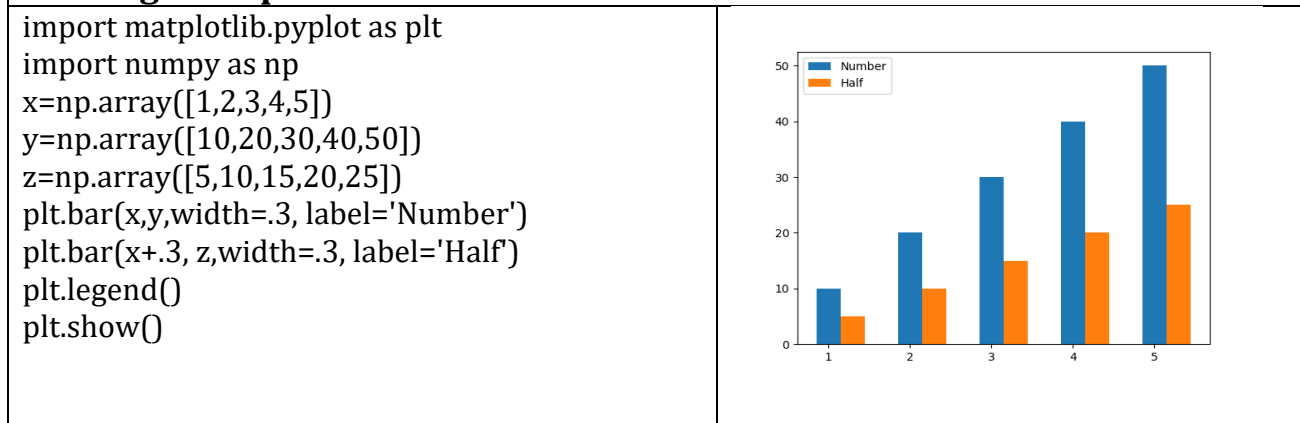


| Arguments in the plot() function |                                                                                                                                                    |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Marker                           | A marker is any symbol that represents a data value in a line chart.<br>Marker can be specified using the codes +, -, o, <, >, ^, x, d, *, etc.    |
| Colour                           | To change the colour of the plotted data. We can specify the colour using the codes b(blue), g(green), r(red), y(yellow), k(black), w(white), etc. |
| Linewidth                        | Used to change the width of the line chart.                                                                                                        |

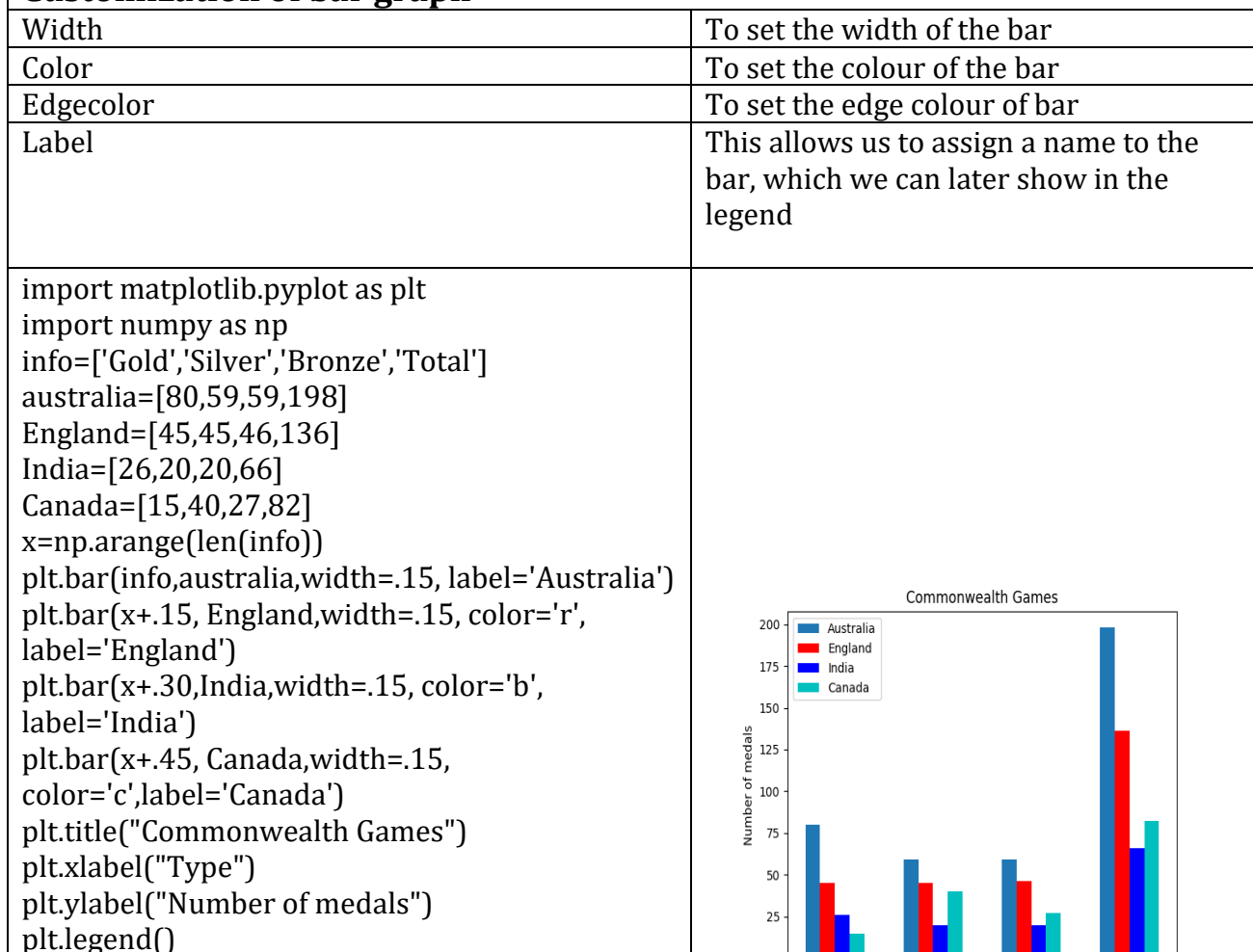
| Linestyle                                                                                                                                                                                                                                                                         | It is used to change the type of line chart. It can be solid, dotted, dashed, dashdot                                                                                                                                                                                                    |                 |               |             |   |            |   |            |   |             |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------|-------------|---|------------|---|------------|---|-------------|---|
| <pre>import matplotlib.pyplot as plt import numpy as np a=[1,2,3,4,5] b=np.array(a)*2 plt.plot(a,b,color='r',marker='d',linewidth=2,linestyle='dashed') plt.xlabel('Number') plt.ylabel("Double") plt.title("Number mapping") plt.grid(True) plt.show()</pre>                     |                                                                                                                                                                                                        |                 |               |             |   |            |   |            |   |             |   |
| Label                                                                                                                                                                                                                                                                             | It allows us to assign a name to the line, which we can later show in the legend.                                                                                                                                                                                                        |                 |               |             |   |            |   |            |   |             |   |
| loc attribute in legend() function                                                                                                                                                                                                                                                | It is used to specify the location of the legend. Default value of loc is 'upper left')                                                                                                                                                                                                  |                 |               |             |   |            |   |            |   |             |   |
| <p>Different values for loc attribute</p> <p>A <b>legend</b> is used to label elements of your plot, like lines or markers, so that viewers can understand what each element represents.</p> <p><b>Example</b></p> <pre>plt.legend(loc= 'upper right') or plt.legend(loc=1)</pre> | <table border="1"> <thead> <tr> <th>Location String</th><th>Location code</th></tr> </thead> <tbody> <tr> <td>upper right</td><td>1</td></tr> <tr> <td>upper left</td><td>2</td></tr> <tr> <td>lower left</td><td>3</td></tr> <tr> <td>lower right</td><td>4</td></tr> </tbody> </table> | Location String | Location code | upper right | 1 | upper left | 2 | lower left | 3 | lower right | 4 |
| Location String                                                                                                                                                                                                                                                                   | Location code                                                                                                                                                                                                                                                                            |                 |               |             |   |            |   |            |   |             |   |
| upper right                                                                                                                                                                                                                                                                       | 1                                                                                                                                                                                                                                                                                        |                 |               |             |   |            |   |            |   |             |   |
| upper left                                                                                                                                                                                                                                                                        | 2                                                                                                                                                                                                                                                                                        |                 |               |             |   |            |   |            |   |             |   |
| lower left                                                                                                                                                                                                                                                                        | 3                                                                                                                                                                                                                                                                                        |                 |               |             |   |            |   |            |   |             |   |
| lower right                                                                                                                                                                                                                                                                       | 4                                                                                                                                                                                                                                                                                        |                 |               |             |   |            |   |            |   |             |   |
| Plotting multiple line chart and using legend ()                                                                                                                                                                                                                                  | A legend in a graph is a small box or area that explains the meaning of symbols, colors, lines, or markers used in the graph. It helps the viewer understand what each visual element represents.                                                                                        |                 |               |             |   |            |   |            |   |             |   |
| <pre>import matplotlib.pyplot as plt x=[1,2,3,4,5] y=[2,4,6,8,10] z=[1,4,9,16,25] plt.plot(x, y, label='Line 1') plt.plot(x, z, label='Line 2') plt.legend(loc= 'upper right') plt.show()</pre>                                                                                   |                                                                                                                                                                                                      |                 |               |             |   |            |   |            |   |             |   |
| plt.figure(figsize=(15,7))                                                                                                                                                                                                                                                        | To set the size of the graph                                                                                                                                                                                                                                                             |                 |               |             |   |            |   |            |   |             |   |
| plt.savefig("squares.png")                                                                                                                                                                                                                                                        | To save the graph as a picture file.                                                                                                                                                                                                                                                     |                 |               |             |   |            |   |            |   |             |   |
| <p><b>Bar Graph:</b> A bar graph is used to represents data in the form of vertical or horizontal bars. It is useful to compare the quantities.</p>                                                                                                                               |                                                                                                                                                                                                                                                                                          |                 |               |             |   |            |   |            |   |             |   |
| Function to create bar graph                                                                                                                                                                                                                                                      | <p><b>bar()</b> for vertical bar graph</p> <p><b>barh()</b> for horizontal bar graph</p>                                                                                                                                                                                                 |                 |               |             |   |            |   |            |   |             |   |

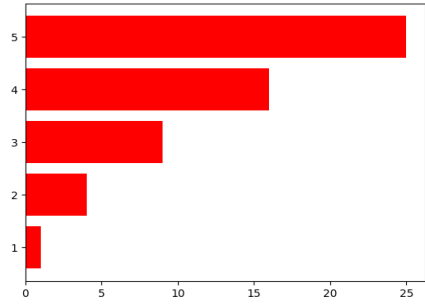
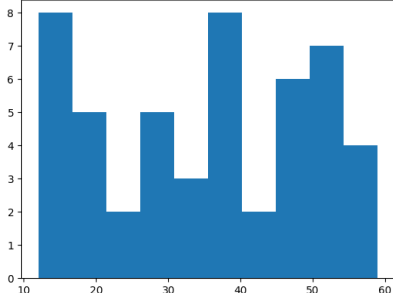
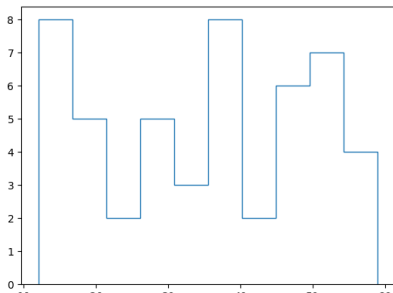
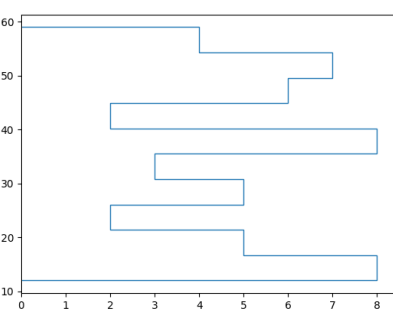


### Plotting multiple bar chart



### Customization of bar graph



|                                                                                                                                                                                                                                                                                                                                                                   |                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| plt.show()                                                                                                                                                                                                                                                                                                                                                        |                                                                                      |
| <b>Creating horizontal bar chart</b><br>import matplotlib.pyplot as plt<br>import numpy as np<br>a=np.array([1,2,3,4,5])<br>b=a**2<br>plt.barh(a,b,color='r')<br>plt.show()                                                                                                                                                                                       |    |
| <b>Histogram</b><br>Histogram shows distribution of values. Histogram is similar to bar graph but it is useful to show values grouped in bins or intervals.                                                                                                                                                                                                       |                                                                                      |
| import matplotlib.pyplot as plt<br>import numpy as np<br>a=np.array([58, 54, 36, 48, 14, 29, 18, 37, 30, 36,<br>15, 21, 53, 14, 28, 24, 12,<br>16, 54, 59, 13, 54, 17, 58, 46, 35, 19, 59, 27, 32, 49,<br>12, 40, 49,<br>41, 24, 42, 37, 40, 54, 16, 45, 51, 38, 18, 31, 49, 28,<br>39, 52])<br>plt.hist(a,bins=10)<br>plt.show()                                 |   |
| Attribute of hist function                                                                                                                                                                                                                                                                                                                                        |                                                                                      |
| Histtype                                                                                                                                                                                                                                                                                                                                                          | bar, barstacked, step, stepfilled<br>default is bar                                  |
| Bins                                                                                                                                                                                                                                                                                                                                                              | bins is an integer; it defines the number of equal-width bins in the range.          |
| import matplotlib.pyplot as plt<br>import numpy as np<br>a=np.array([58, 54, 36, 48, 14, 29, 18, 37, 30, 36,<br>15, 21, 53, 14, 28, 24, 12,<br>16, 54, 59, 13, 54, 17, 58, 46, 35, 19, 59, 27, 32, 49,<br>12, 40, 49,<br>41, 24, 42, 37, 40, 54, 16, 45, 51, 38, 18, 31, 49, 28,<br>39, 52])<br>plt.hist(a,bins=10, histtype='step')<br>plt.show()                |  |
| For horizontal histogram use the attribute orientation with value 'horizontal'                                                                                                                                                                                                                                                                                    |                                                                                      |
| import matplotlib.pyplot as plt<br>import numpy as np<br>a=np.array([58, 54, 36, 48, 14, 29, 18, 37, 30, 36,<br>15, 21, 53, 14, 28, 24, 12,<br>16, 54, 59, 13, 54, 17, 58, 46, 35, 19, 59, 27, 32, 49,<br>12, 40, 49,<br>41, 24, 42, 37, 40, 54, 16, 45, 51, 38, 18, 31, 49, 28,<br>39, 52])<br>plt.hist(a,bins=10, histtype='step',<br>orientation='horizontal') |  |

## Multiple Choice Questions

**Q1. Which Python library is commonly used for data visualization?**

- a) NumPy    b) Pandas    c) matplotlib    d) SciPy

**Answer: c) matplotlib**

**Q2. What does the plot() function in matplotlib do?**

- a) Reads a file    b) Draws a line chart    c) Displays data in a table    d) Opens a window

**Answer: b) Draws a line chart**

**Q3. Which function is used to display the plot on screen?**

- a) show()    b) display()    c) render()    d) open()

**Answer: a) show()**

**Q4. Which parameter is used to label a line in plot() for legends?**

- a) text    b) label    c) name    d) legend

**Answer: b) label**

**Q5. What is the purpose of legend() function in matplotlib?**

- a) To save the plot    b) To show grid lines  
c) To display the labels of plotted data    d) To format the plot

**Answer: c) To display the labels of plotted data**

## Assertion and Reasoning Based Questions

**Mark the correct choice as:**

- A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A)  
B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A)  
C. Assertion (A) is true, but Reason (R) is false  
D. Assertion (A) is false, but Reason (R) is true

**Q. 1 Assertion(A):** Bar charts are suitable for comparing different categories of discrete data.

**Reason (R):** Bar charts display data using bins, and the bars touch each other without gaps.

**Answer: C**

**Q. 2 Assertion (A):** Line charts are best used to display data that changes over time.

**Reason (R):** Line charts help in observing trends and patterns in time-series data.

**Answer: A**

**Q.3 Assertion (A):** In a histogram, bars must have gaps between them.

**Reason (R):** Histogram is used for plotting frequency of discrete data.

**Answer: D**

## Exercise

**Q. 1 Write a Python code using matplotlib to:**

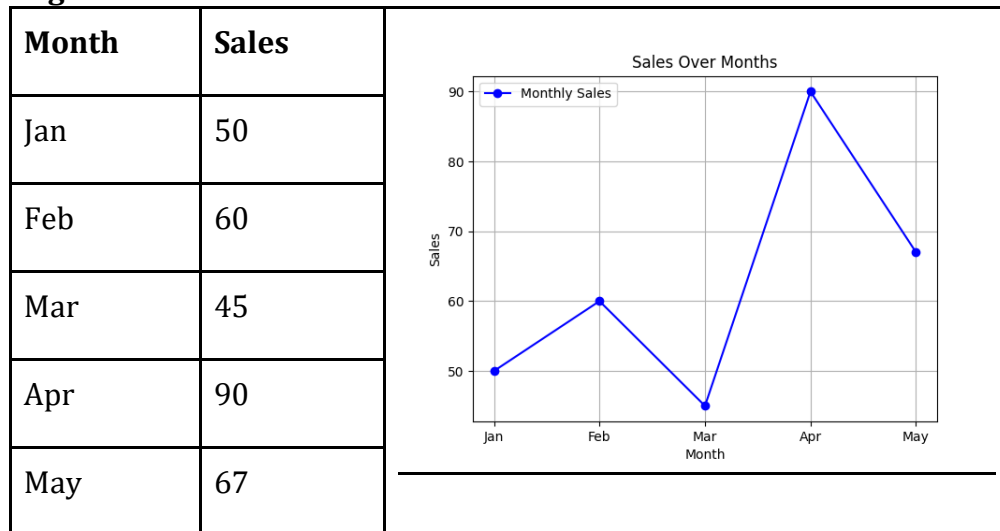
1. Plot a bar chart for sales data ['Q1', 'Q2', 'Q3', 'Q4'] with corresponding values [150, 200, 180, 220].
2. Set bar colour to cyan.
3. Label axes as "Quarter" and "Sales (in ₹)".

4. Include a title “Quarterly Sales” and display values on top of each bar.

**Answer:**

```
import matplotlib.pyplot as plt
quarters = ['Q1', 'Q2', 'Q3', 'Q4']
sales = [150, 200, 180, 220]
plt.bar(quarters, sales, color='cyan') # Custom bar color
plt.xlabel('Quarter') # X-axis label
plt.ylabel('Sales (in ₹)') # Y-axis label
plt.title('Quarterly Sales') # Plot title
plt.show()
```

**Q. 2 Radhika has to fill in the blanks in the given Python program that generates a line plot as shown below. The given line plot represents the sales in lakhs over five months as given in the table**



```
import _____ as plt #statement 1
months = ['Jan', 'Feb', 'Mar', 'Apr', 'May']
sales = [50, 60, 45, 90, 67]
plt._____(months, sales, marker='o', color='blue', linestyle='-', label='Monthly Sales')
 #statement 2
plt.xlabel('_____') #statement 3
plt.ylabel('Sales')
plt.title('_____') #statement 4
plt.grid(True)
plt.legend()
plt.show()
```

**Write the missing statement according to given specification**

1. write the suitable code to import the required module in the blank space in the line mark as statement 1
2. fill in the blank in statement 2 with a suitable function name to create a line plot.
3. referred to the graph shown and fill in the blank in statement 3 to display the appropriate label for x axis.
4. refer to the graph shown and fill in the blank in statement 4 to display the suitable chart title.

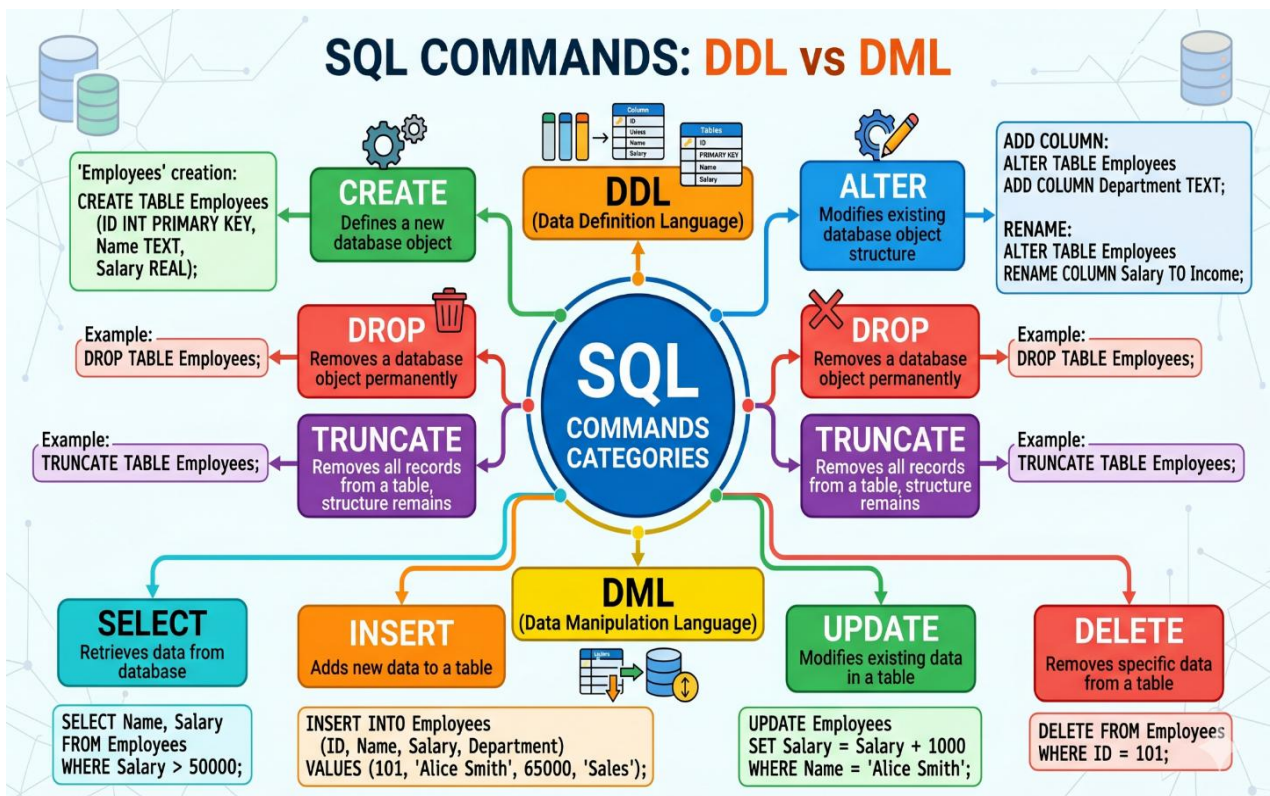
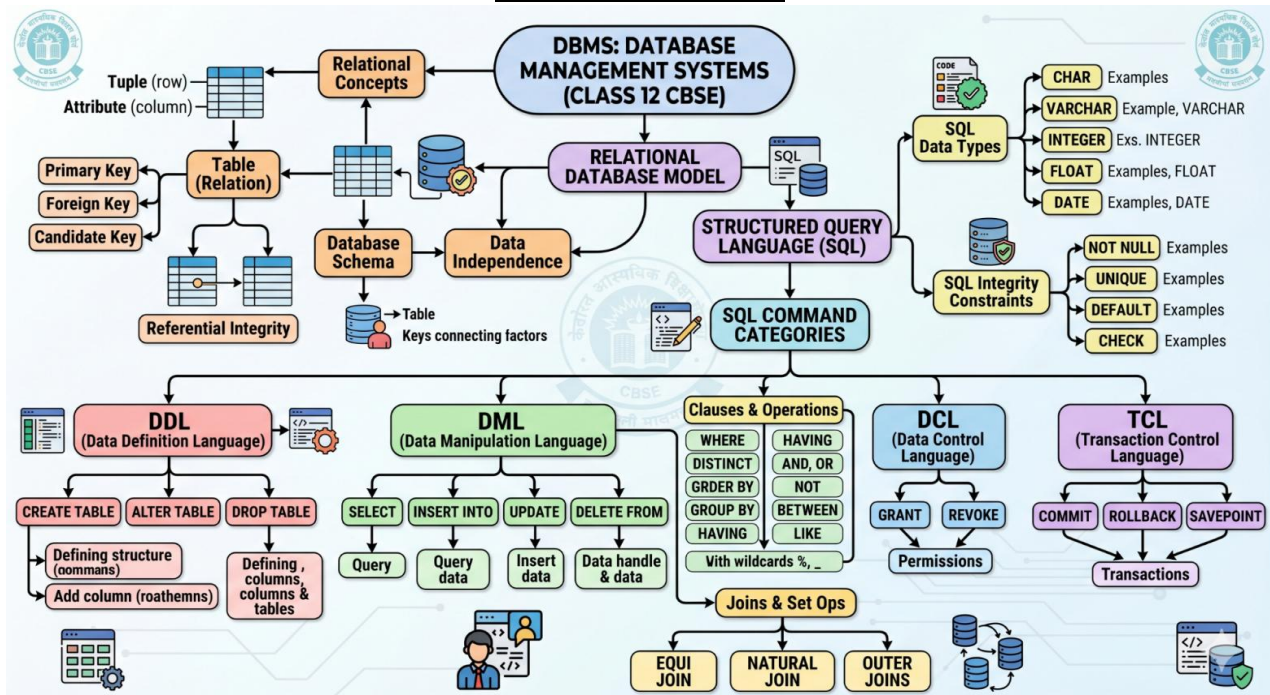
**Answer:**

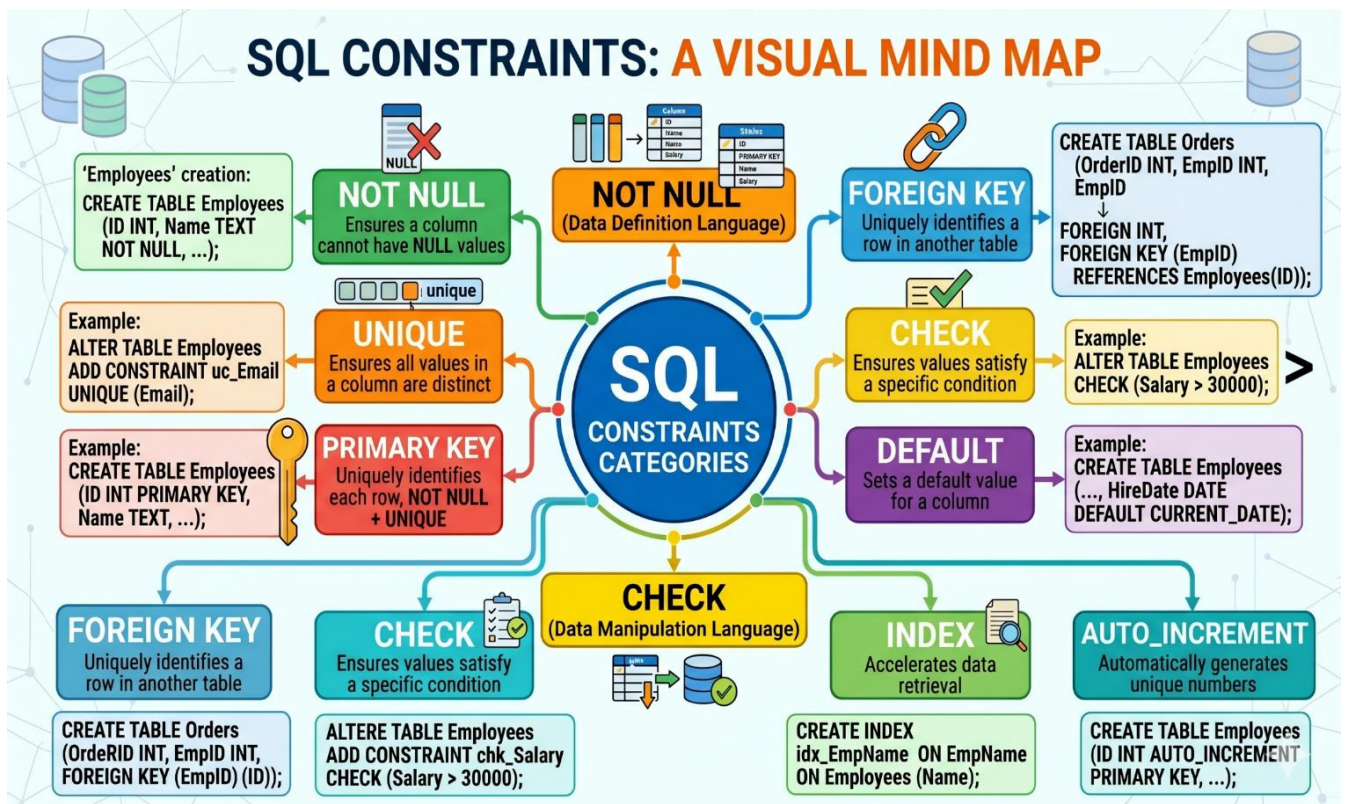
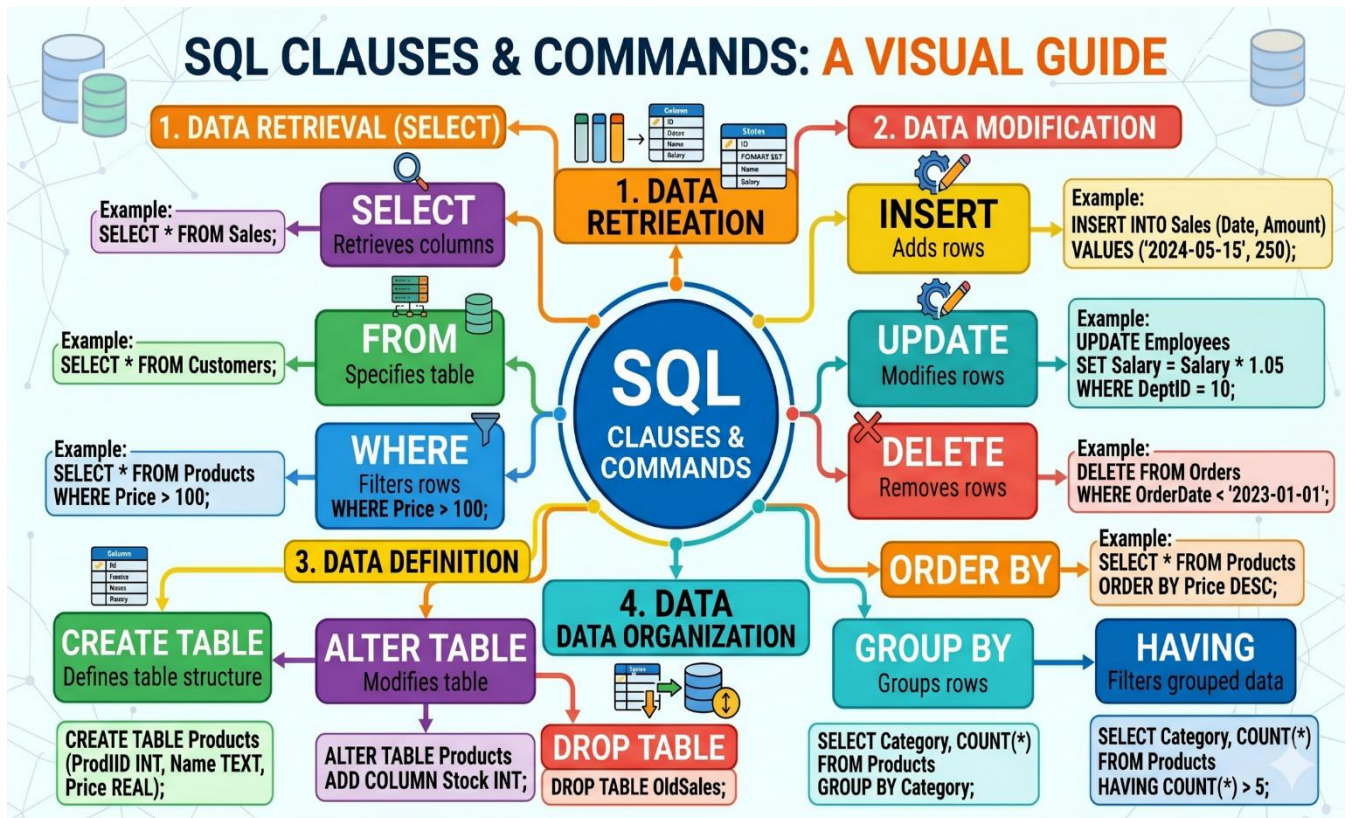
```
import matplotlib.pyplot as plt #statement 1
months = ['Jan', 'Feb', 'Mar', 'Apr', 'May']
```

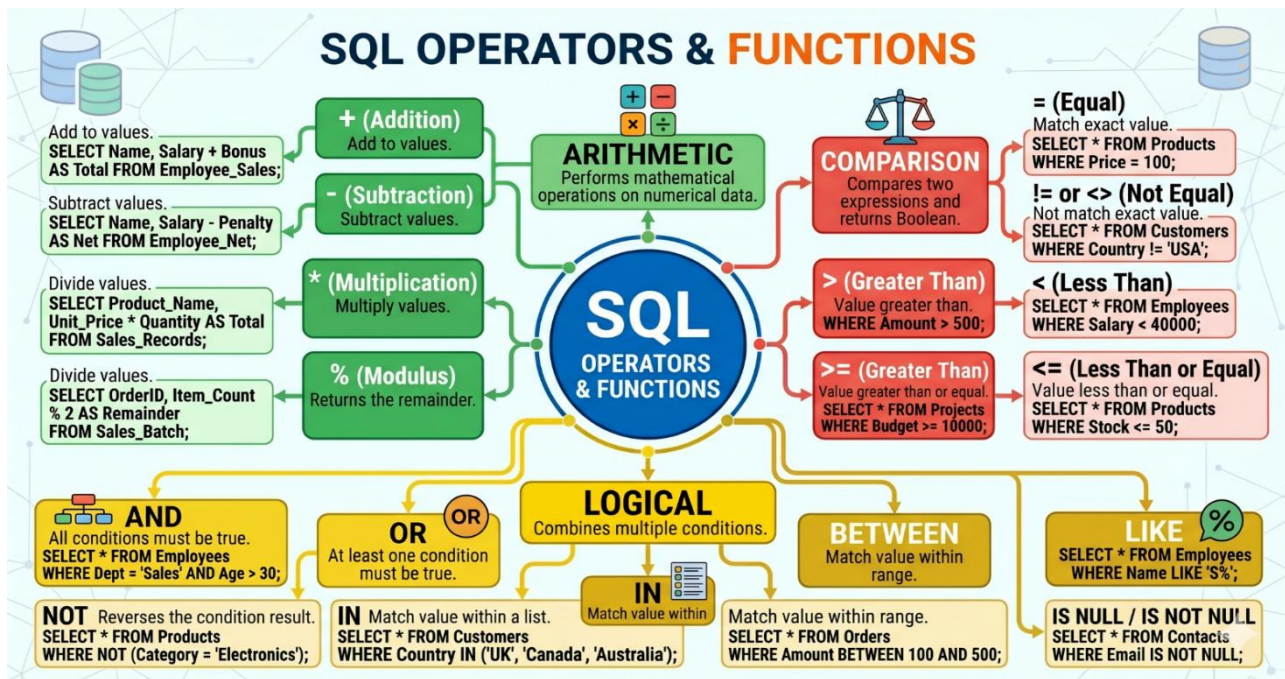
```
sales = [50, 60, 45, 90, 67]
plt.plot(months, sales, marker='o', color='blue', linestyle='-', label='Monthly Sales')
 #statement 2
plt.xlabel('Month')
 #statement 3
plt.ylabel('Sales')
plt.title('Sales Over Months')
 #statement 4
plt.grid(True)
plt.legend()
plt.show()
```

# Unit 2: Database Query Using SQL

## MIND MAPS







# Revision of Database Concepts and SQL Commands (covered in Class XI)

## 1. What is a Database?

A database is like a digital filing cabinet. It stores information in a structured way on a computer. It is a well-organized collection of data about a specific topic or business.

### Need of a database

Databases help us manage information efficiently.

4. It reduces repetition or duplicity of data.
5. It keeps data consistent at every places.
6. It allows many people to share the same data.
7. It protects data.
8. It makes sure that data is correct.

Example: A school database might store student names, addresses, and grades.

## 2. Database Management System (DBMS)

9. A DBMS is a software that creates, accesses, and manages databases. It helps to store, search and modify data easily.
10. Examples: MySQL, Oracle, MongoDB, PostgreSQL etc

## 3. Relational Data Model

This model organizes or stores data in the form of tables. Each table contains rows and columns. Tables are related to each other. Each table has multiple columns, and each column has a unique name. Tables are also known as **relations**.

Example: A table of students and a table of courses can be linked(related) by a "student ID" column.

## 4. Key Concepts

| SN | Name of Concept                       | Explanation with example                                                                                                                                                                                                   |
|----|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <b>Domain</b>                         | A domain is a set of values that can be stored in a column of a database table. They have the allowed values for a column.<br>Example: A "gender" column might have a domain of "Male" or "Female." in attendance register |
| 2  | <b>Table (Relation)</b>               | A collection of related data in rows and columns.                                                                                                                                                                          |
| 3  | <b>Tuple/ Record</b>                  | It is a row in a table. Example: One student's information in a student table                                                                                                                                              |
| 4  | <b>Attribute / Field</b>              | It is a column in a table. Example: "Name," "grade," or "Roll Number" in a student table.                                                                                                                                  |
| 5  | <b>Degree</b>                         | The number of columns in a table.                                                                                                                                                                                          |
| 6  | <b>Cardinality</b>                    | The number of rows in a table.                                                                                                                                                                                             |
| 7  | <b>Candidate Key</b>                  | A column (or set of columns) that can uniquely identify a row.<br>Example: Student ID or admission number                                                                                                                  |
| 8  | <b>Primary Key</b>                    | A chosen candidate key or a column which will uniquely identify a row in a table. A table can only have one primary key. Example: Student Roll Number                                                                      |
| 9  | <b>Alternate Key</b>                  | A candidate key that is not chosen as the primary key. Example If Student Roll Number is the primary key, then maybe Email Address could be an alternate key.                                                              |
| 10 | <b>Data Definition Language (DDL)</b> | DDL commands are used to define the database structure. They handle creating, altering, and deleting tables and databases.                                                                                                 |

|    |                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | <b>Data Manipulation Language (DML)</b> | DML commands are used to manage the data within the database. This includes inserting, selecting, updating, and deleting data. Examples: <b>INSERT</b> , <b>SELECT</b> , <b>UPDATE</b> , <b>DELETE</b> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 12 | <b>Introduction to MySQL</b>            | MySQL is a popular, free and open-source database management system. It is used by many websites and applications. It is reliable, fast, and easy to use.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 13 | <b>Creating a Database</b>              | The <b>CREATE DATABASE</b> command makes a new database.<br>Syntax: <b>CREATE DATABASE &lt;database_name&gt;;</b><br>Example: <b>CREATE DATABASE SchoolDB;</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 14 | <b>Data types</b>                       | Data Types specify the kind of data a column can hold (e.g., text, numbers, dates).<br>Examples:<br>11. <b>CHAR (size)</b> : Fixed-length text string.<br>12. <b>VARCHAR (size)</b> : Variable-length text string.<br>13. <b>INT (size)</b> : Integer number.<br>14. <b>DATE</b> : Date value (YYYY-MM-DD).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 15 | <b>Creating a Table</b>                 | The <b>CREATE TABLE</b> command makes a new table in a database.<br>Syntax:<br><b>CREATE TABLE &lt;table_name&gt; (</b><br>column1 datatype,<br>column2 datatype,<br>...<br><b>);</b><br><br>Example:<br><b>CREATE TABLE Students (StudentID INT, Name VARCHAR (255), Address VARCHAR (255));</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 16 | <b>Drop : Deleting a Table</b>          | The <b>DROP TABLE</b> command removes a table from the database.<br>Syntax: <b>DROP TABLE &lt;table_name&gt;;</b><br>Example:<br><b>DROP TABLE Students;</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 17 | <b>Alter Command</b>                    | The <b>ALTER</b> command modifies the structure of a table. <b>ALTER TABLE</b> command allows us to perform the following operations:<br>▪ <b>Adding new column in existing table</b><br>Syntax: <b>ALTER TABLE &lt;table-name&gt; ADD COLUMN &lt;column-name&gt; datatype(length);</b><br>Example: <b>ALTER TABLE employee ADD COLUMN grade char(2);</b><br>▪ <b>Dropping existing column from table</b><br>Syntax: <b>ALTER TABLE &lt;table-name&gt; DROP COLUMN &lt;column-name&gt;;</b><br>Example: <b>ALTER TABLE employee DROP COLUMN grade;</b><br>▪ <b>Modifying column definition in table</b><br>Syntax: <b>ALTER TABLE &lt;table-name&gt; MODIFY column-name datatype(length);</b><br>Example: <b>ALTER TABLE employee MODIFY ename varchar (25);</b><br>▪ <b>Changing the name of column</b><br>Syntax: <b>ALTER TABLE &lt;table-name&gt; CHANGE [&lt;old column-name&gt;] [&lt;new column-name&gt;] &lt;datatype&gt;;</b><br>Example: <b>ALTER TABLE students CHANGE grade score char (2);</b><br>▪ <b>Dropping constraint after table creation.</b> |

|    |                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                | <p>Syntax: ALTER TABLE [&lt;table_name&gt;] DROP CONSTRAINT [&lt;constraint_name&gt;];</p> <p>Example: ALTER TABLE emp drop PRIMARY KEY</p> <p>ALTER TABLE emp ALTER TABLE &lt;table_name&gt;</p> <p><b>i. Adding constraint after table creation.</b></p> <p>Syntax: ALTER TABLE [&lt;table_name&gt;] ADD CONSTRAINT [&lt;constraint_name&gt;];</p> <p>Example: ALTER TABLE emp ADD UNIQUE emp_name;</p>                                                                         |
| 18 | <b>Data Query</b>              | Querying involves retrieving specific data from the database                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 19 | <b>Select Query</b>            | <p>SELECT Command: With the SELECT command we can retrieve previously inserted rows. The general form of SELECT is:</p> <p>Syntax: SELECT column names FROM table_name;</p> <p>Example: SELECT * FROM Student;</p> <p>SELECT name, stream FROM Student;</p>                                                                                                                                                                                                                       |
| 20 | <b>Where Clause</b>            | <p>The WHERE clause is used to retrieve data that satisfy the specified conditions. With WHERE clause the following operators can be used:</p> <ul style="list-style-type: none"> <li>• Comparison/ Relational Operators are: &lt;, &lt;=, =, !=, &lt;&gt;, &gt;=, &gt;</li> <li>• Logical Operators are: AND &lt; &lt;= OR NOT =</li> <li>• Comparison operator for special value – NULL, IS NULL</li> </ul>                                                                     |
| 21 | <b>Relational Operators</b>    | <p>Example: SELECT * FROM Student WHERE Age &lt; 18;</p> <p>SELECT name FROM Student WHERE stream = " S"</p> <p>SELECT name, age, stream FROM Student WHERE Stream='C';</p>                                                                                                                                                                                                                                                                                                       |
| 22 | <b>BETWEEN Operator</b>        | <p>The `BETWEEN` operator selects values within a given range.</p> <p>Example: `SELECT * FROM Products WHERE Price BETWEEN 10 AND 20;`</p>                                                                                                                                                                                                                                                                                                                                        |
| 23 | <b>Logical Operators</b>       | <p>Logical operators (`AND`, `OR`, `NOT`) combine conditions.</p> <p><b>OR:</b> True if <b>either</b> condition is true</p> <p>Example: Age &gt; 18 <b>or</b> City = 'Mumbai'</p> <p>Means either age &gt;18 or city is Mumbai</p> <p><b>NOT:</b> Reverses the condition</p> <p>Example: NOT City = 'Delhi'</p> <p>Means exclude Delhi</p> <p><b>AND:</b> True if <b>both</b> conditions are true</p> <p>Example: SELECT * FROM Students WHERE Age &gt;18 AND City = 'Delhi';</p> |
| 24 | <b>NULL Value</b>              | NULL` represents a missing or unknown value.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 25 | <b>NOT NULL Constraint</b>     | The `NOT NULL` constraint ensures that a column cannot have a null value.                                                                                                                                                                                                                                                                                                                                                                                                         |
| 26 | <b>IS NULL and IS NOT NULL</b> | <p>`IS NULL` and `IS NOT NULL` are used to check for null values.</p> <p>Example: SELECT * FROM Students WHERE Phone IS NULL;</p>                                                                                                                                                                                                                                                                                                                                                 |
| 27 | <b>Inserting Data</b>          | <p>The `INSERT INTO` command adds new rows to a table.</p> <p>Syntax: INSERT INTO table name VALUES (value1, value2, ...);</p> <p>Example: INSERT INTO Students VALUES (1, 'John Doe', 'Delhi');</p>                                                                                                                                                                                                                                                                              |
| 28 | <b>Deleting Data</b>           | <p>The `DELETE` command removes rows from a table.</p> <p>Syntax: DELETE FROM table name WHERE condition;</p> <p>Example: DELETE FROM Students WHERE StudentID = 1;</p>                                                                                                                                                                                                                                                                                                           |
| 29 | <b>Updating Data</b>           | <p>The `UPDATE` command modifies existing rows in a table.</p> <p>Syntax: UPDATE table name SET column1 = value1, ... WHERE condition;</p> <p>Example: UPDATE Students SET City = 'Pune' WHERE StudentID = 1;</p>                                                                                                                                                                                                                                                                 |

**Consider following table Student**

Students (RollNo, Name, Marks, Grade)

| RollNo | Name    | Marks | Grade |
|--------|---------|-------|-------|
| 101    | Alice   | 84.75 | B     |
| 102    | Bob     | 91.45 | A     |
| 103    | Charlie | 76.20 | B     |
| 104    | David   | 68.99 | C     |
| 105    | Eva     | 88.33 | B     |

**Multiple Choice Questions (MCQ)**

| QN | Question                                                                                                                                                                                                                                                 | Answer                                                                                                                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | What is the primary purpose of a database?<br>A) To store data in an unorganized manner<br>B) To manage and organize data efficiently for retrieval and manipulation<br>C) To create graphical user interfaces<br>D) To perform hardware troubleshooting | B) To manage and organize data efficiently for retrieval and manipulation<br><b>Explanation:</b> A database is used to store, manage, and retrieve data in an organized manner to support efficient operations. |
| 2  | Which of the following is a function of a DBMS?<br>A) Creating web applications<br>B) Ensuring data integrity and security<br>C) Managing computer hardware<br>D) Writing operating system code                                                          | B) Ensuring data integrity and security<br><b>Explanation:</b> A DBMS ensures data integrity, security, and efficient data management.                                                                          |
| 3  | In the relational model, a tuple is:<br>A) A column in a table B) A row in a table<br>C) A table in a database D) A database schema                                                                                                                      | B) A row in a table<br><b>Explanation:</b> A tuple represents a single row in a relation (table) in the relational model.                                                                                       |
| 4  | Which key uniquely identifies a tuple in a relation and is chosen by the database designer?<br>A) Candidate Key B) Alternate Key<br>C) Primary Key D) Foreign Key                                                                                        | C) Primary Key<br><b>Explanation:</b> The primary key is chosen by the designer to uniquely identify tuples in a table.                                                                                         |
| 5  | _____ is an example of a Data Manipulation Language (DML) command.<br>A) CREATE B) DROP C) INSERT D) ALTER                                                                                                                                               | C) INSERT<br><b>Explanation:</b> INSERT is a DML command which is used to add new record in a table.                                                                                                            |
| 6  | _____ is used to create a new database in MySQL.<br>A) NEW DATABASE B) CREATE DATABASE<br>C) MAKE DATABASE D) ADD DATABASE                                                                                                                               | B) CREATE DATABASE<br><b>Explanation:</b> The `CREATE DATABASE` command is used to create a new database in MySQL.                                                                                              |
| 7  | The data type which is most suitable for storing the "Marks" column in the Students table (assuming whole numbers)?<br>A) VARCHAR B) INT C) FLOAT D) DATE                                                                                                | B) INT<br><b>Explanation:</b> INT is used for whole numbers, suitable for storing marks.                                                                                                                        |
| 8  | Identify the query to add a new column "Phone" to the Students table?<br>A) ALTER TABLE Students ADD Phone VARCHAR (10);<br>B) MODIFY TABLE Students Phone VARCHAR (10);                                                                                 | A) ALTER TABLE Students ADD Phone VARCHAR (10);<br>-: The `ALTER TABLE ... ADD` command is used to add a new column.                                                                                            |

|    |                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                         |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | C) ADD COLUMN Students Phone VARCHAR (10);<br>D) UPDATE TABLE Students Phone VARCHAR (10);                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                         |
| 9  | Identify the query to retrieve students with marks between 60 and 90 (inclusive)?<br>A) SELECT * FROM Students WHERE Marks BETWEEN 60 AND 90;<br>B) SELECT * FROM Students WHERE Marks > 60 AND Marks < 90;<br>C) SELECT * FROM Students WHERE Marks IN (60, 90);<br>D) SELECT * FROM Students WHERE Marks = 60 OR Marks = 90;                                                       | A) SELECT * FROM Students WHERE Marks BETWEEN 60 AND 90;<br><b>Explanation:</b> The `BETWEEN` operator includes the range 60 to 90 (inclusive).                                         |
| 10 | Among the following find out the correct query to retrieve students from "Delhi" with marks greater than 75?<br>A) SELECT * FROM Students WHERE City = 'Delhi' OR Marks > 75;<br>B) SELECT * FROM Students WHERE City = 'Delhi' AND Marks > 75;<br>C) SELECT * FROM Students WHERE City = 'Delhi' XOR Marks > 75;<br>D) SELECT * FROM Students WHERE City != 'Delhi' AND Marks > 75; | B) SELECT * FROM Students WHERE City = 'Delhi' AND Marks > 75;<br><b>Explanation:</b> The `AND` operator ensures that both the conditions (City = 'Delhi' and Marks > 75) must be true. |

## Assertion and Reasoning-Based Questions

**Mark the correct choice as**

- (a) Both A and R are true and R is the correct explanation for A
- (b) Both A and R are true and R is not the correct explanation for A
- (c) A is True but R is False
- (d) A is false but R is True
- (e) Both A and R are False

| QN | Question                                                                                                                                                                     | Answer                                                           |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 1  | <b>Assertion (A):</b> A primary key can never have NULL values.<br><b>Reason (R):</b> A primary key uniquely identifies each record in a table.                              | (a) Both A and R are true and R is the correct explanation for A |
| 2  | <b>Assertion (A):</b> DROP TABLE command permanently removes the table and its data.<br><b>Reason (R):</b> DROP is used to delete selected rows from a table.                | (c) A is True but R is False                                     |
| 3  | <b>Assertion (A):</b> A tuple refers to a row in a relation.<br><b>Reason (R):</b> A domain refers to the number of rows in a table.                                         | (c) A is True but R is False                                     |
| 4  | <b>Assertion (A):</b> SQL is used to create, modify, and retrieve data from databases.<br><b>Reason (R):</b> SQL is a programming language used to create operating systems. | (c) A is True but R is False                                     |

|    |                                                                                                                                                                             |                                                                      |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 5  | <b>Assertion (A):</b> The BETWEEN operator includes both boundary values.<br><b>Reason (R):</b> BETWEEN 10 AND 20 includes 10 and 20 in the result.                         | (a) Both A and R are true and R is the correct explanation for A     |
| 6  | <b>Assertion (A):</b> A candidate key may have duplicate values.<br><b>Reason (R):</b> Candidate keys are used to establish relationships between tables.                   | (e) Both A and R are False                                           |
| 7  | <b>Assertion (A):</b> IS NULL is used to find rows with undefined (missing) values in a column.<br><b>Reason (R):</b> NULL means a value of 0.                              | (c) A is True but R is False                                         |
| 8  | <b>Assertion (A):</b> ALTER TABLE command can be used to add a new column to an existing table.<br><b>Reason (R):</b> ALTER is only used to remove columns from a table.    | (c) A is True but R is False                                         |
| 9  | <b>Assertion (A):</b> MySQL is an example of a relational database management system.<br><b>Reason (R):</b> MySQL allows storage of unstructured media files such as images | (b) Both A and R are true and R is not the correct explanation for A |
| 10 | <b>Assertion (A):</b> SELECT is used to retrieve data from one or more tables.<br><b>Reason (R):</b> SELECT statement modifies existing data in a table.                    | (c) A is True but R is False                                         |
| 11 | <b>Assertion (A):</b> A relation in a relational database is also known as a table.<br><b>Reason (R):</b> Relations contain rows and columns to store data.                 | (a) Both A and R are true and R is the correct explanation for A     |
| 12 | <b>Assertion (A):</b> INSERT command adds new records into a table.<br><b>Reason (R):</b> DELETE command is also used to insert records into a table.                       | (c) A is True but R is False                                         |

### Very Short Questions

| QN | Question                                                 | Answer                                                                                                                                                                                                              |
|----|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Differentiate between a database and a DBMS.             | A database is a collection of organized data, while a DBMS is a software to manage that data.<br>Example: Student records are a database; Oracle is a DBMS to handle them.                                          |
| 2  | State two advantages of using a DBMS.                    | 1. Data Consistency: Reduces redundancy by storing data centrally.<br>2. Security: Provides access control to protect data.                                                                                         |
| 3  | How does a DBMS reduce data redundancy?                  | Answer: A DBMS stores data in a centralized manner, eliminating duplicate copies using normalized tables, ensuring efficient storage.<br>Example: Storing customer details once in a single table.                  |
| 4  | Differentiate between a candidate key and a primary key. | A candidate key is a set of attributes that uniquely identifies tuples, while a primary key is one chosen candidate key.<br>Example: RollNo and Email can be candidate keys; RollNo is selected as the primary key. |

|    |                                                                                                                              |                                                                                                                                                              |
|----|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5  | Differentiate between DDL and DML.                                                                                           | DDL (Data Definition Language): Defines database structure, e.g., CREATE, DROP.<br>DML (Data Manipulation Language): Manipulates data, e.g., INSERT, UPDATE. |
| 6  | How can you verify a database creation in MySQL?                                                                             | Use the command `SHOW DATABASES;` to list all databases, checking if the created database (e.g., Library) appears.                                           |
| 7  | Differentiate between CHAR and VARCHAR data types.                                                                           | CHAR: Fixed-length string, e.g., CHAR (10) always uses 10 spaces.<br>VARCHAR: Variable-length string, e.g., VARCHAR (10) uses only required spaces.          |
| 8  | Write the command to create a table "Employee" where EmpID column as a primary key and Name column should not be left blank. | `CREATE TABLE Employee (EmpID INT primary key, Name VARCHAR (50) not null);`                                                                                 |
| 9  | Manoj wants to delete a record from "Employee" whose EmpID is 5. Help him to write a query in MySQL.                         | `DELETE FROM Employee WHERE EmpID = 5;`                                                                                                                      |
| 10 | Smita wants to modify the value in the marks column to 95 whose roll no is 101 in the student table.                         | `UPDATE Student SET Marks = 95 WHERE RollNo = 101;`                                                                                                          |
| 11 | Write the query to add a column "Salary" to the "Employee" table.                                                            | `ALTER TABLE Employee ADD Salary DECIMAL (10,2);`                                                                                                            |
| 12 | Categorize the following commands as DDL or DML: INSERT, UPDATE, ALTER, DROP                                                 | INSERT, UPDATE: DML<br>ALTER, DROP: DDL                                                                                                                      |

### Case- Based Questions

| QN | Question                                                                                                                                                                                                                                                                                                                                                                                                                                      | Answer                                                                                                                                                                            |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Ritika, a computer science teacher, is guiding her students in maintaining a record of exam results using MySQL. She creates a table named Student to store the following details:<br>Help her to write query for:<br>i) Ritika wants to find out which students have scored <b>more than 85 marks</b> .<br>ii) One student's marks was entered incorrectly. Ritika wants to change David's marks to 72.65. Write the SQL command to do this. | i) SELECT Name FROM Student WHERE Marks > 85;<br><br>ii) UPDATE Student SET Marks = 72.65 WHERE Name = 'David';<br><br>iii) INSERT INTO Student VALUES (106, 'Frank', 80.5, 'B'); |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                             |                    |                    |           |               |            |                |            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------------|-----------|---------------|------------|----------------|------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | iii) A new student named Frank with RollNo 106, Marks 80.5 and Grade B join the class. Help Ritika to insert the record into the table.                                                                                                                                     |                    |                    |           |               |            |                |            |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | RELATION: LIBRARY                                                                                                                                                                                                                                                           |                    |                    |           |               |            |                |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Book_ID                                                                                                                                                                                                                                                                     | Title              | Author             | Category  | Price         | Issued     |                |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 101                                                                                                                                                                                                                                                                         | Python Programming | Nitin Sinha        | Computer  | 350.00        | Yes        |                |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 102                                                                                                                                                                                                                                                                         | Wings of Fire      | A.P.J. Abdul Kalam | Biography | 275.50        | No         |                |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 103                                                                                                                                                                                                                                                                         | Learning MySQL     | Vikram Dutt        | Computer  | 425.00        | Yes        |                |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 104                                                                                                                                                                                                                                                                         | The Alchemist      | Paulo Coelho       | Fiction   | 200.00        | No         |                |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 105                                                                                                                                                                                                                                                                         | Introduction to AI | Anjali Mehta       | Computer  | 500.00        | Yes        |                |            |
| Rohit, a school librarian, wants to digitize the library's records to manage the availability and issue of books efficiently. He designs a table named Library in MySQL with the following fields:<br>i) Write an SQL query to display books with price greater than 300 and less than or equal to 450.<br>ii) Rohit mistakenly entered a wrong category for Book_ID 104. Write the command to change its category to 'Literature'.<br>iii) Rohit wants to delete the record of the book titled 'The Alchemist'. Write the SQL command.<br><br><b>Answers:</b><br>i) SELECT * FROM Library WHERE Price > 300 AND Price <= 450;<br>ii) UPDATE Library SET Category = 'Literature' WHERE Book_ID = 104;<br>iii) DELETE FROM Library WHERE Title = 'The Alchemist'; |                                                                                                                                                                                                                                                                             |                    |                    |           |               |            |                |            |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Dr. Mehta, the administrator of Sunrise Hospital, is developing a database to manage patient records. She designs a <b>table Patient</b> to store patient details. Help her to write the query. The structure and data of the table is as follows:<br><br>RELATION: PATIENT |                    |                    |           |               |            |                |            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Patient_ID                                                                                                                                                                                                                                                                  | Name               | Age                | Gender    | Disease       | Doctor     | Admission_Date | Discharged |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P101                                                                                                                                                                                                                                                                        | Ananya Sharma      | 32                 | F         | Pneumonia     | Dr. Kapoor | 2024-01-12     | Yes        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P102                                                                                                                                                                                                                                                                        | Rahul Verma        | 45                 | M         | Diabetes      | Dr. Sinha  | 2024-02-15     | No         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P103                                                                                                                                                                                                                                                                        | Meena Iyer         | 28                 | F         | Migraine      | Dr. Kapoor | 2024-01-20     | Yes        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P104                                                                                                                                                                                                                                                                        | Aman Joshi         | 55                 | M         | Heart Disease | Dr. Bhalla | 2024-03-02     | No         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | P105                                                                                                                                                                                                                                                                        | Riya Malhotra      | 40                 | F         | Arthritis     | Dr. Sinha  | 2024-02-25     | Yes        |
| i) Write the SQL query to display the name and disease of all patients who are still admitted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                             |                    |                    |           |               |            |                |            |

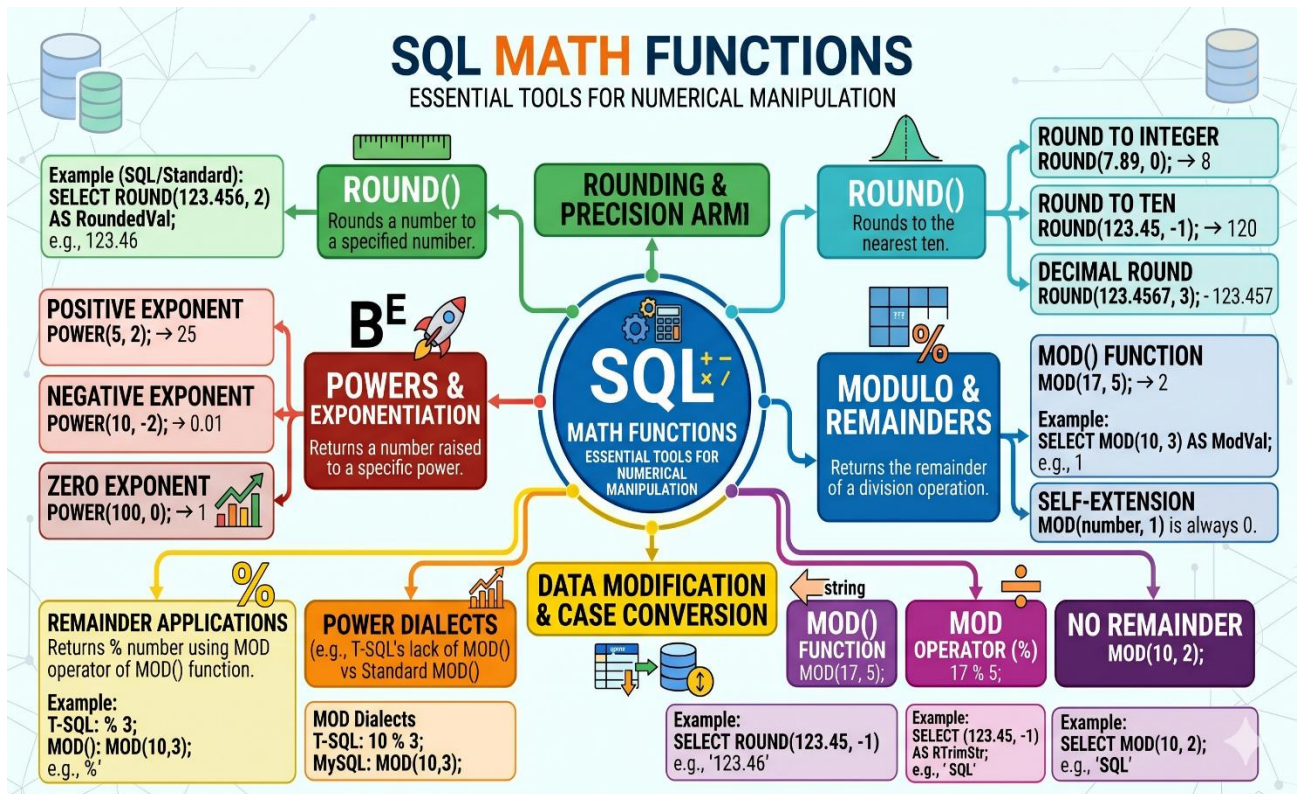
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>ii) Write an SQL command to insert a new record: Patient_ID: P106, Name: Veer Singh, Age: 38, Gender: M, Disease: Asthma, Doctor: Dr. Kapoor, Admission_Date: '2024-03-10', Discharged: No</p> <p>iii) Find the names of all patients who were admitted in February 2024.</p> <p><b>Answers:</b></p> <p>i) SELECT Name, Disease FROM Patient WHERE Discharged = 'No';</p> <p>ii) INSERT INTO Patient VALUES ('P106', 'Veer Singh', 38, 'M', 'Asthma', 'Dr. Kapoor', '2024-03-10', 'No');</p> <p>iii) SELECT Name FROM Patient WHERE Admission_Date BETWEEN '2024-02-01' AND '2024-02-29';</p> |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Long Answer Questions

Refer table Student

| QN | Question                                                                                                                                                                                                                                                                              | Answer                                                                                                                                                                                                                                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <p>i) Identify the <b>Primary key</b> and any <b>Alternate key</b> in the <b>Student</b> table.</p> <p>ii) Write the command to create the database SchoolDB and use it.</p> <p>iii) Write the SQL command to create the Student table as per the structure above.</p>                | <p><b>i) Primary Key:</b> RollNo (unique for every student)</p> <p><b>Alternate Key:</b> Name (assuming no two students have the same name)</p> <p><b>ii) CREATE DATABASE</b> SchoolDB;<br/>USE SchoolDB;</p> <p><b>iii) CREATE TABLE</b> Student (RollNo INT PRIMARY KEY, Name VARCHAR(50), Marks decimal(5,2), Grade CHAR(1));</p> |
| 2  | <p>i) Insert the following record into the Student table: RollNo: 106, Name: Farah, Marks: 79.45, Grade: B</p> <p>ii) Write a query to display names of students who scored marks between 80 and 90.</p> <p>iii) Write the SQL command to delete the record of the student David.</p> | <p>i) INSERT INTO Student VALUES (106, 'Farah', 79.45, 'B');</p> <p>ii) SELECT Name FROM Student WHERE Marks BETWEEN 80 AND 90;</p> <p>iii) DELETE FROM Student WHERE Name = 'David';</p>                                                                                                                                            |
| 3  | <p>i) Increase the marks of all students with grade 'B' by 5 marks.</p> <p><b>ii) What is the degree and cardinality of the Student table?</b></p>                                                                                                                                    | <p>i) UPDATE Student SET Marks = Marks + 5 WHERE Grade = 'B';</p> <p>ii) Degree (Number of columns): <b>4</b><br/>Cardinality (Number of rows): <b>5</b></p>                                                                                                                                                                         |
| 4  | <p>i) Write the SQL query to display RollNo and Name of students whose Grade is NOT NULL.</p> <p>ii) Change the data type of column Marks to DECIMAL (5,2) using SQL.</p> <p>iii) Write the command to remove the entire table Student from the database.</p>                         | <p>i) SELECT RollNo, Name FROM Student WHERE Grade IS NOT NULL;</p> <p>ii) ALTER TABLE Student MODIFY Marks DECIMAL (5,2);</p> <p>iii) DROP TABLE Student;</p>                                                                                                                                                                       |

# MySQL Functions:

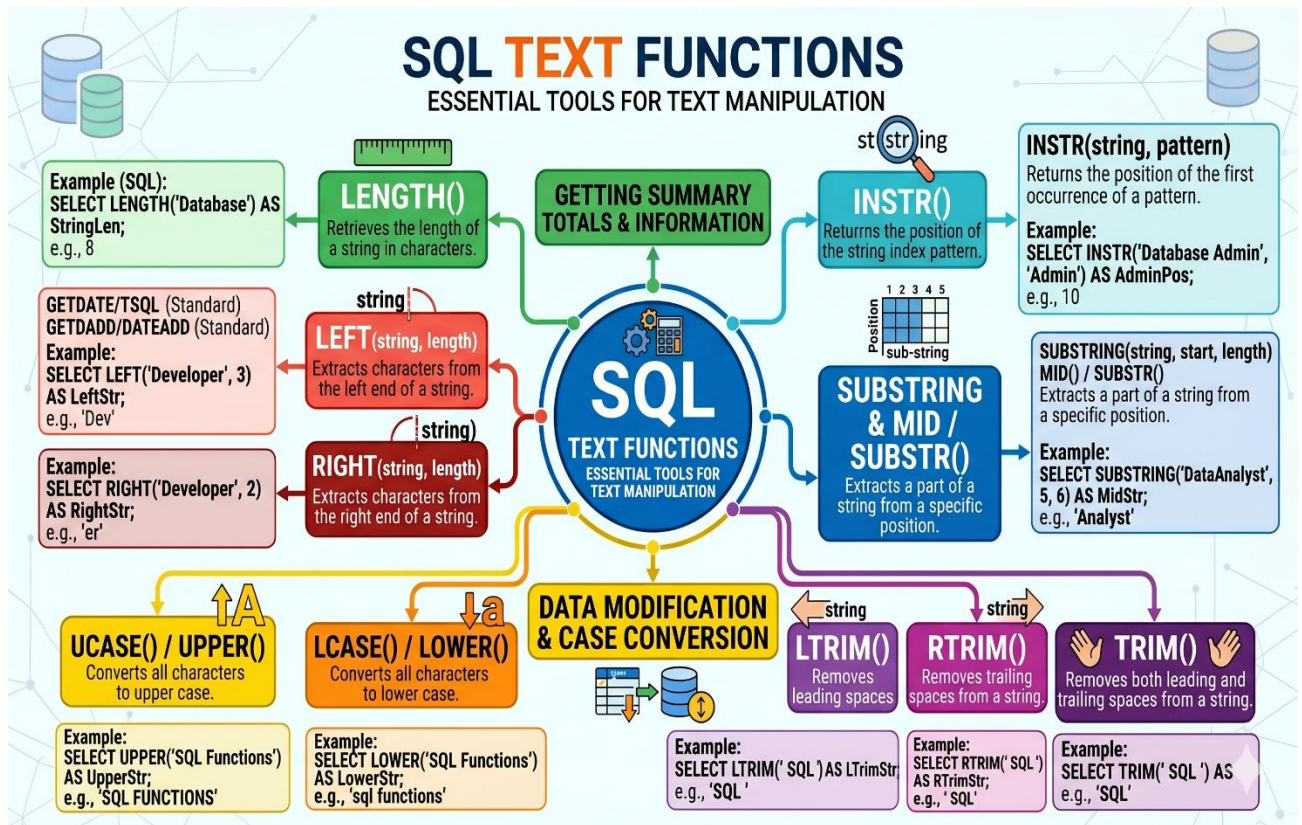


## Math Functions:

### Mod (), Power () & Round()

Three commonly used numeric functions are POWER(), ROUND() and MOD().

| Function                  | Description                                                                                                            | Example                                                                                                        |
|---------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| POWER(P, Q) or POW (P, Q) | Calculates P to the power Q.                                                                                           | <code>SELECT POWER (2,3);</code><br>Output: 8<br>(because $2 \times 2 \times 2 = 8$ )                          |
| ROUND(N, D)               | Rounds off number N to D number of decimal places. Note: If D=0, then it rounds off the number to the nearest integer. | <code>SELECT ROUND (3.14159, 2);</code><br>Output:3.14<br><br><code>SELECT ROUND (165.2);</code><br>Output:165 |
| MOD(X, Y)                 | Returns the remainder after dividing number X by number Y.                                                             | <code>mysql&gt; SELECT MOD (10, 3);</code><br>Output:1<br>(because $10 \div 3 = 3$ remainder 1)                |



## String/Text functions:

UCASE ()/UPPER (), LCASE ()/LOWER (), MID ()/SUBSTRING ()/SUBSTR (), LENGTH (), LEFT (), RIGHT (), INSTR(), LTRIM (), RTRIM(), TRIM ().

String functions in SQL are powerful tools for manipulating text data. They allow us to modify, extract, and format strings in various ways.

| Function Name                                                                    | Description                                                               | Example                                                      | Output                                             |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------|
| UCASE(string)<br>OR<br>UPPER(string)                                             | Converts a string to uppercase                                            | <code>SELECT<br/>UPPER('MySql');</code>                      | MYSQL                                              |
| LOWER(string)<br>OR<br>LCASE(string)                                             | Converts a string to lowercase                                            | <code>SELECT LOWER('MYSQL');</code>                          | mysql                                              |
| SUBSTRING(string, pos, n) OR<br>MID(string, pos, n)<br>OR<br>SUBSTR(str, pos, n) | Extracts a substring from a string. <b>Index starts at 1</b>              | <code>SELECT<br/>SUBSTRING('DataBase Systems', 1, 4);</code> | BaseS<br>(Starts at 1st char., takes 4 characters) |
| LENGTH(string)<br>OR<br>LEN(string)                                              | Returns the length of a string                                            | <code>SELECT LENGTH(' SQL Rocks!');</code>                   | 12 (Counts all characters including spaces)        |
| LEFT(string, N)                                                                  | Returns the left part of a string with the specified number of characters | <code>SELECT<br/>LEFT('Environment', 6);</code>              | Enviro                                             |

|                          |                                                                            |                                                        |                            |
|--------------------------|----------------------------------------------------------------------------|--------------------------------------------------------|----------------------------|
| RIGHT(string, N)         | Returns the right part of a string with the specified number of characters | SELECT<br>RIGHT('comment', 4);                         | ment                       |
| INSTR(string, substring) | Returns the position of the first occurrence of a substring                | SELECT INSTR('I love learning SQL and Python', 'SQL'); | 17 (Starts at position 17) |
| LTRIM(string)            | Removes leading spaces from a string                                       | SELECT LTRIM(' Hello World');                          | Hello World                |
| RTRIM(string)            | Removes trailing spaces from a string                                      | SELECT RTRIM('Hello World ');                          | Hello World                |
| TRIM(string)             | Removes leading and trailing spaces from a string                          | SELECT TRIM(' Hello World ');                          | Hello World                |

### Multiple Choice Questions

| QN | Question                                                                                                                      | Answer                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1  | <b>What does</b> TRIM(' AI Tools ') <b>return?</b><br>A) ' AI Tools '      B) 'AITools'<br>C) 'AI Tools'      D) ' AI Tools ' | C) 'AI Tools'<br>Explanation: TRIM() removes spaces from both ends.                  |
| 2  | <b>What is the output of</b> LTRIM(' Coding')?<br>A) ' Coding'      B) ' Coding '<br>C) 'Coding'      D) 'Coding '            | C) 'Coding'<br>Explanation: LTRIM() removes spaces from left side only               |
| 3  | <b>What is the position of "SQL" in</b> INSTR('Learn SQL Programming', 'SQL')?<br>A) 7    B) 8    C) 7    D) 6                | C) 7<br>Explanation: "SQL" starts at 7th position in the string.                     |
| 4  | <b>What does</b> RIGHT('EXAMINATION', 6) <b>return?</b><br>A) ATION      B) TION<br>C) NATION      D) INATION                 | C) NATION<br>Explanation: Last 6 letters "NATION"                                    |
| 5  | <b>What is the result of</b> SUBSTRING('ComputerScience', 9, 7)?<br>A) puterSc      B) mputer<br>C) Science      D) terScie   | C) Science<br>Explanation: Starts at position 9 → "S", takes 7 letters → "Science"   |
| 6  | <b>What does</b> LENGTH('Python 3') <b>return?</b><br>A) 6    B) 8    C) 7    D) 9                                            | B) 8<br>Explanation:<br>Characters including space: "P y t h o n _ 3" → 8 characters |
| 7  | <b>What is the output of</b> UCASE('cbse board')?<br>A) cbse board    B) CBSE BOARD<br>C) Cbse board    D) CBSe BOARD         | B) CBSE BOARD<br>Explanation:<br>UCASE() converts text to uppercase → "CBSE BOARD"   |

### Assertion and Reasoning-Based Questions

**Mark the correct choice as**

- (a) Both A and R are true and R is the correct explanation for A  
 (b) Both A and R are true and R is not the correct explanation for A

(c) A is True but R is False

(d) A is false but R is True

| QN | Question                                                                                                                                                                                        | Answer                                                                                                                                               |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <b>Assertion (A):</b> TRIM(' Hello ') returns 'Hello'.<br><b>Reason (R):</b> The TRIM() function removes all internal spaces from a string.                                                     | (c) A is true but R is false<br>Explanation: TRIM() removes only leading and trailing spaces, not the spaces between words.                          |
| 2  | <b>Assertion (A):</b> INSTR('Banana', 'n') returns 3.<br><b>Reason (R):</b> INSTR() returns the position of the first occurrence of a substring.                                                | Answer: (a) Both A and R are true and R is the correct explanation for A<br>Explanation: 'n' first appears at the 3rd position in 'Banana'.          |
| 3  | <b>Assertion (A):</b> LEFT('Notebook', 4) returns 'Note'.<br><b>Reason (R):</b> The LEFT() function returns the last n characters of a string.                                                  | Answer: (c) A is true but R is false<br>Explanation: LEFT() returns the first n characters, not the last                                             |
| 4  | <b>Assertion (A):</b> The LENGTH('apple') function returns 6.<br><b>Reason (R):</b> The LENGTH() function returns the number of characters in a string.                                         | Answer: (d) A is false but R is true<br>Explanation: LENGTH('apple') returns 5, not 6.                                                               |
| 5  | <b>Assertion (A):</b> MID('Computer', 2, 3) returns 'omp'.<br><b>Reason (R):</b> The MID() or SUBSTRING() function extracts a portion of a string from a given position for a specified length. | Answer: (a) Both A and R are true and R is the correct explanation for A<br>Explanation: Starting from position 2, extract 3 characters → "omp".     |
| 6  | <b>Assertion (A):</b> The function UCASE('hello') returns HELLO.<br><b>Reason (R):</b> The UCASE() or UPPER() function is used to convert text to uppercase.                                    | Answer: (a) Both A and R are true and R is the correct explanation for A<br>Explanation: UCASE() or UPPER() converts lowercase to uppercase letters. |
| 7  | <b>Assertion (A):</b> The MOD(17, 5) function returns 2.<br><b>Reason (R):</b> The MOD() function returns the product of the two numbers.                                                       | Answer: (c) A is true but R is false<br>Explanation: MOD() returns the remainder of division, not the product. $17 \div 5 = 3$ remainder             |
| 8  | <b>Assertion (A):</b> The POWER(2, 3) function returns 8.<br><b>Reason (R):</b> The POWER() function is used to raise one number to the power of another.                                       | Answer: (a) Both A and R are true and R is the correct explanation for A<br>Explanation: $2^3 = 8$ ; POWER(2, 3) means 2 raised to the power of 3    |

## Very Short Questions

Consider a following table and answer the following questions

Students (RollNo, Name, Marks, Grade)

| RollNo | Name  | Marks | Grade |
|--------|-------|-------|-------|
| 101    | Alice | 84.75 | B     |

| RollNo | Name    | Marks | Grade |
|--------|---------|-------|-------|
| 102    | Bob     | 91.45 | A     |
| 103    | Charlie | 76.20 | B     |
| 104    | David   | 68.99 | C     |
| 105    | Eva     | 88.33 | B     |

| QN | Question                                                                                                                        | Answer                                                         |
|----|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| 1  | Write a query to display the names of all students in uppercase.                                                                | SELECT UPPER(Name) FROM STUDENT;                               |
| 2  | Write a query to show the first 3 characters of each student's name.                                                            | SELECT LEFT(Name, 3) FROM STUDENT;                             |
| 3  | Write a query to display each student's name and the result of Marks MOD 10 (i.e., the remainder when marks are divided by 10). | SELECT Name, MOD(Marks, 10) AS Remainder FROM STUDENT;         |
| 4  | Write a query to display Name and the position of letter 'a' in the name using the INSTR) function.                             | SELECT Name, INSTR(Name, 'a') AS Position FROM STUDENT;        |
| 5  | Write a query to display the Name, Marks, and rounded marks (to nearest integer) of each student.                               | SELECT Name, Marks, ROUND(Marks) AS RoundedMarks FROM STUDENT; |

### Case- Based Questions

| QN     | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |            |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|--------|------------|------|--------------|----------|-------|------|------------|----------|----|------|-------------|----------|---------|------|--------------|----------|----|------|------------|----------|----|
| 1      | <p>The HR department of <b>TechNova Ltd.</b> maintains a table named Employee that stores information about employees' names, salaries, and departments. Here's a sample of the table:</p> <table><tr><th>Emp_ID</th><th>Name</th><th>Salary</th><th>Department</th></tr><tr><td>E101</td><td>rohit sharma</td><td>45200.75</td><td>Sales</td></tr><tr><td>E102</td><td>Ananya Das</td><td>37800.50</td><td>HR</td></tr><tr><td>E103</td><td>MEENA JOSHI</td><td>62000.00</td><td>Finance</td></tr><tr><td>E104</td><td>sushil mehra</td><td>50000.25</td><td>IT</td></tr><tr><td>E105</td><td>Divya Nair</td><td>47000.00</td><td>HR</td></tr></table> <p><b>Help her to write query for</b></p> <ul style="list-style-type: none"><li>i) Write an SQL query to display all employee names in uppercase.</li><li>ii) Display the last 4 characters of the employee names</li><li>iii) Write a query to round the salaries to the nearest 100.</li><li>iv) Display employee names without leading and trailing spaces.</li></ul> <p><b>Answers:</b></p> <ul style="list-style-type: none"><li>i) SELECT UPPER(Name) FROM Employee;</li><li>ii) SELECT RIGHT(Name, 4) FROM Employee;</li><li>iii) SELECT Name, ROUND(Salary, -2) FROM Employee;</li><li>iv) SELECT TRIM(Name) FROM Employee;</li></ul> | Emp_ID   | Name       | Salary | Department | E101 | rohit sharma | 45200.75 | Sales | E102 | Ananya Das | 37800.50 | HR | E103 | MEENA JOSHI | 62000.00 | Finance | E104 | sushil mehra | 50000.25 | IT | E105 | Divya Nair | 47000.00 | HR |
| Emp_ID | Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Salary   | Department |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |
| E101   | rohit sharma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 45200.75 | Sales      |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |
| E102   | Ananya Das                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 37800.50 | HR         |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |
| E103   | MEENA JOSHI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 62000.00 | Finance    |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |
| E104   | sushil mehra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 50000.25 | IT         |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |
| E105   | Divya Nair                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 47000.00 | HR         |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |
| 2      | <p>BookBazaar maintains a table named Books to store details of the books available in their store. Here's a sample of the table:</p> <ul style="list-style-type: none"><li>● Write a query to round off the prices to the nearest whole number.</li><li>● Show the square of the price of each book.</li><li>● Extract 3 characters starting from position 6 from each author's name.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |          |            |        |            |      |              |          |       |      |            |          |    |      |             |          |         |      |              |          |    |      |            |          |    |

**RELATION : Book\_ID**

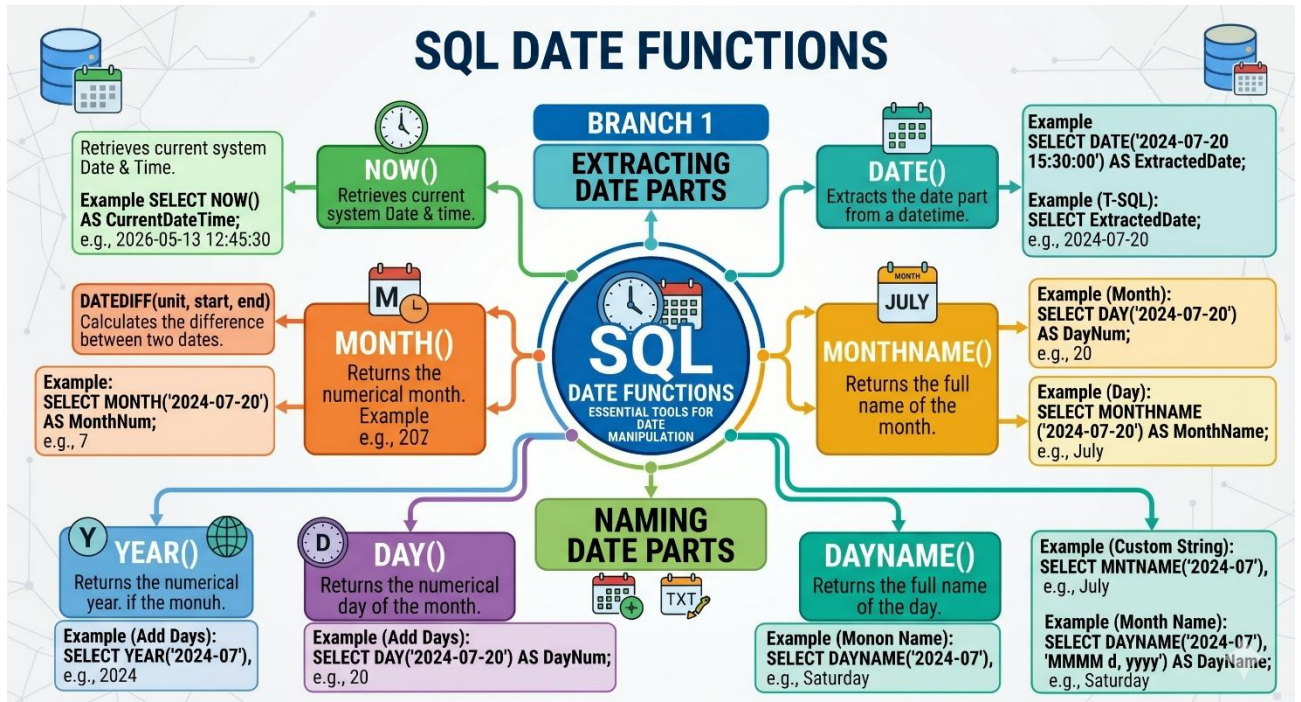
| <b>Book_ID</b> | <b>Title</b>             | <b>Author</b>     | <b>Price</b> |
|----------------|--------------------------|-------------------|--------------|
| B101           | the alchemist            | paulo coelho      | 299.75       |
| B102           | Wings of Fire            | A.P.J Abdul Kalam | 350.40       |
| B103           | the theory of everything | Stephen Hawking   | 499.99       |
| B104           | deep work                | Cal Newport       | 280.00       |
| B105           | zero to one              | Peter Thiel       | 399.50       |

**Answer:**

- i) SELECT Title, ROUND(Price) FROM Books;
- ii) SELECT Title, POWER(Price, 2) FROM Books;
- iii)** SELECT SUBSTRING(Author, 6, 3) FROM Books;

# DATE FUNCTIONS:

## CONCEPT MAP



1. **NOW()** : Returns the current date and time as a datetime value.

Example:

`SELECT NOW();`

```
+-----+
| NOW() |
+-----+
| 2025-04-25 15:05:56 |
+-----+
```

2. **DATE()** : Extracts the date part from a datetime expression.

Example:

`SELECT DATE(NOW());`

```
+-----+
| DATE(NOW()) |
+-----+
| 2025-04-25 |
+-----+
```

3. **MONTH()** : Returns the month number (1-12) from a date.

Example:

`SELECT MONTH('2025-04-25');`

```
+-----+
| MONTH('2025-04-25') |
+-----+
| 4 |
+-----+
```

4. **MONTHNAME()** : Returns the full month name of a date.

Example:

`SELECT MONTHNAME('2025-04-25');`

```

+-----+
| MONTHNAME('2025-04-25') |
+-----+
| April |
+-----+

```

5. **YEAR( )** : Extracts the year from a date value.

**Example:**

```
SELECT YEAR('2025-04-25');
```

```

+-----+
| YEAR('2025-04-25') |
+-----+
| 2025 |
+-----+

```

6. **DAY( )** : Returns the day of the month (1-31) from a date.

**Example:**

```
SELECT DAY('2025-04-25');
```

```

+-----+
| DAY('2025-04-25') |
+-----+
| 25 |
+-----+

```

7. **DAYNAME( )** : Returns the name of the weekday for a date.

**Example:**

```
SELECT DAYNAME('2025-04-25');
```

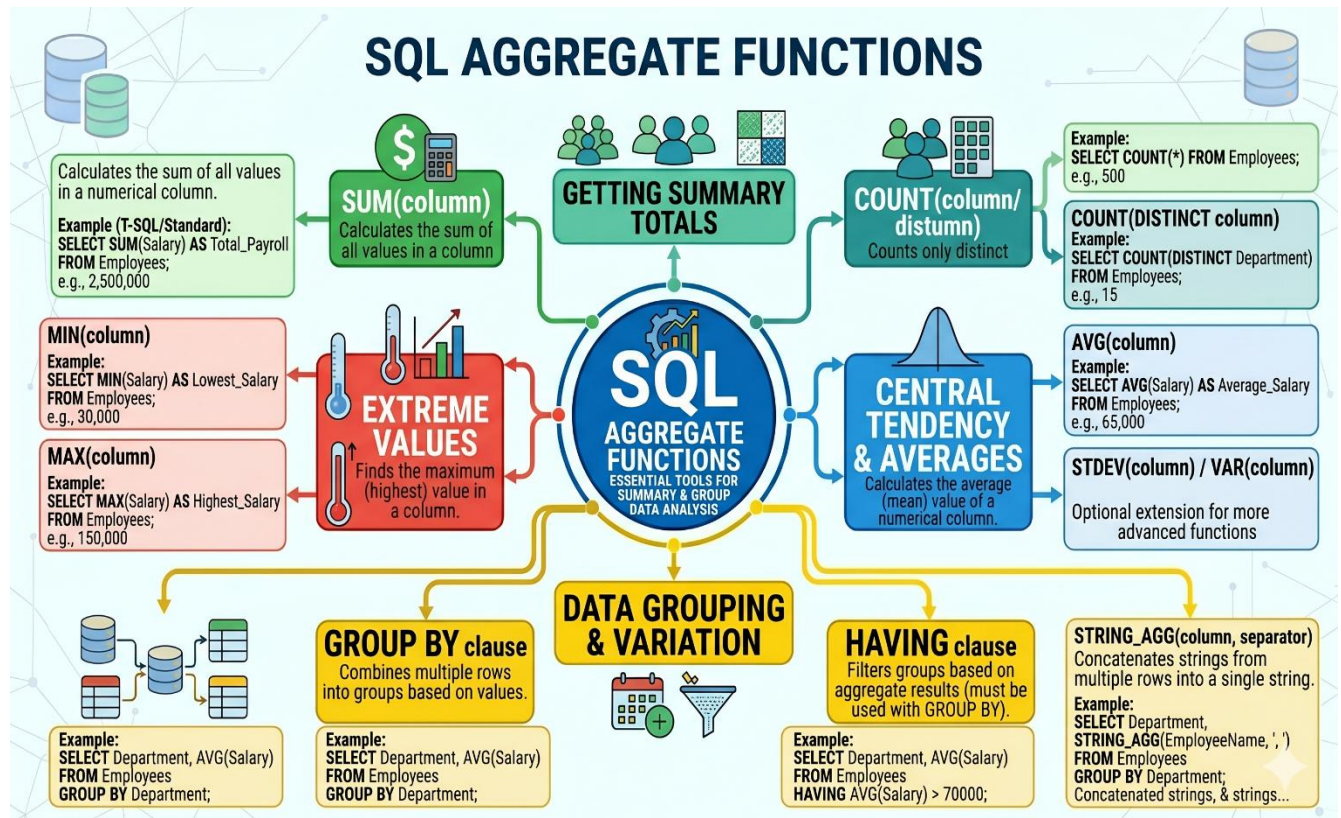
```

+-----+
| DAYNAME('2025-04-25') |
+-----+
| Friday |
+-----+

```

# AGGREGATE FUNCTIONS

## CONCEPT MAP



Aggregate functions are special SQL functions that perform calculations on multiple rows and return a single value.

Consider the below Table **Employees** in order to understand the concept of aggregate function with examples.

**Employees Table**

| employee_id | first_name | last_name | department  | salary   | hire_date  | birth_date |
|-------------|------------|-----------|-------------|----------|------------|------------|
| 1           | John       | Smith     | Engineering | 75000.00 | 2020-05-15 | 1985-03-25 |
| 2           | Sarah      | Johnson   | Marketing   | 68000.00 | 2019-10-10 | 1990-07-12 |
| 3           | Michael    | Davis     | Engineering | 82000.00 | 2018-02-28 | 1982-11-30 |
| 4           | Emily      | Wilson    | HR          | 62000.00 | 2021-01-05 | 1992-04-18 |
| 5           | David      | Brown     | Engineering | 79000.00 | 2017-08-01 | 1988-09-03 |
| 6           | Lisa       | Miller    | Marketing   | 70000.00 | 2019-03-15 | 1991-05-22 |
| 7           | Robert     | Taylor    | Finance     | 90000.00 | 2016-11-12 | 1980-12-15 |
| 8           | Jennifer   | Anderson  | HR          | 64000.00 | 2022-06-20 | 1994-02-28 |
| 9           | William    | Thomas    | Engineering | 85000.00 | 2018-07-09 | 1986-08-17 |
| 10          | Jessica    | Moore     | Finance     | 88000.00 | 2017-04-25 | 1983-10-10 |

## BASIC AGGREGATE FUNCTIONS

1. **COUNT()** : The COUNT function counts rows or values. It's like asking "How many?"

Examples:

- a. Count all rows in the employees table

**SELECT COUNT(\*) FROM employees;**

```

+-----+
| COUNT(*) |
+-----+
| 10 |
+-----+

```

**b. Count employees in the Engineering department**

**SELECT COUNT(\*) FROM employees WHERE department = 'Engineering';**

```

+-----+
| COUNT(*) |
+-----+
| 4 |
+-----+

```

**c. Count how many different departments exist**

**SELECT COUNT(DISTINCT department) FROM employees;**

```

+-----+
| COUNT(DISTINCT department) |
+-----+
| 4 |
+-----+

```

The DISTINCT keyword makes COUNT only count unique values, ignoring duplicates.

- SUM():** The SUM function adds up numeric values. It's like asking "What's the total?"

**Example: Calculate total salary budget**

**SELECT SUM(salary) FROM employees;**

```

+-----+
| SUM(salary) |
+-----+
| 763000.00 |
+-----+

```

- AVG():** The AVG function calculates the average (mean) of numeric values. It's like asking "What's the typical value?"

**Example: Find average employee salary**

**SELECT AVG(salary) FROM employees;**

```

+-----+
| AVG(salary) |
+-----+
| 76300.000000 |
+-----+

```

- MIN():** This function finds the smallest (MIN) value. They're like asking "What's the lowest?"

**Example: Find lowest salary**

**SELECT MIN(salary) FROM employees;**

```

+-----+
| MIN(salary) |
+-----+
| 62000.00 |
+-----+

```

5. **MAX()** : This function finds the smallest (MIN) or largest (MAX) value. They're like asking "What's the lowest/highest?"

**Example: Find highest salary**

**SELECT MAX(salary) FROM employees;**

```

+-----+
| MAX(salary) |
+-----+
| 90000.00 |
+-----+

```

## COUNT() vs COUNT(\*) in SQL

The main difference between COUNT() and COUNT(\*) is what they count:

- COUNT(\*) counts all rows in the result set, including those with NULL values
- COUNT(column) counts only non-NULL values in the specified column

| id | name    | department | manager_id |
|----|---------|------------|------------|
| 1  | Alice   | Sales      | 5          |
| 2  | Bob     | Marketing  | NULL       |
| 3  | Charlie | Sales      | 5          |
| 4  | David   | IT         | NULL       |
| 5  | Eve     | Management | NULL       |

**SELECT COUNT(\*) FROM employees;**

v/s

**SELECT COUNT(manager\_id) FROM employees;**

The results would be:

- COUNT(\*): 5 (counts all rows)
- COUNT(manager\_id): 2 (counts only non-NULL values in manager\_id column)

This distinction is important when working with data that might contain NULL values, as the two counting methods can give significantly different results.

## QUERYING AND MANIPULATING DATA

### GROUP BY and HAVING Clauses

#### GROUP BY Clause

The GROUP BY clause lets you group rows that have the same values into summary rows. It's like sorting information into piles or categories. When combined with aggregate functions, it helps you analyse data by groups.

#### Basic GROUP BY Syntax

```

SELECT column1, aggregate_function(column2)
FROM table
GROUP BY column1;

```

**For example:** Count employees in each department

```

SELECT department, COUNT(*) AS employee_count
FROM employees

```

GROUP BY department;

| department  | employee_count |
|-------------|----------------|
| Engineering | 4              |
| Marketing   | 2              |
| HR          | 2              |
| Finance     | 2              |

### The SELECT List Rule in GROUP BY Clause

In standard SQL, if you use GROUP BY, each column in your SELECT list must either:

1. Be included in the GROUP BY clause, OR
2. Be used within an aggregate function

**Example:**

**SELECT department, COUNT(\*), AVG(salary)**

**FROM employees**

**GROUP BY department;**

| department  | COUNT(*) | AVG(salary)  |
|-------------|----------|--------------|
| Engineering | 4        | 80250.000000 |
| Marketing   | 2        | 69000.000000 |
| HR          | 2        | 63000.000000 |
| Finance     | 2        | 89000.000000 |

### What is the HAVING Clause?

The HAVING clause filters groups, similar to how the WHERE clause filters individual rows. It's like setting requirements for which groups should appear in your results.

**Example:**

**SELECT department, COUNT(\*) AS employee\_count**

**FROM employees**

**GROUP BY department**

**HAVING COUNT(\*) > 2;**

| department  | employee_count |
|-------------|----------------|
| Engineering | 4              |

This shows only departments that have more than 2 employees.

### ORDER BY Clause

The ORDER BY clause sorts the result set of a query based on one or more columns. Think of it like organizing a list alphabetically or numerically to make it easier to find what you're looking for.

**Order By Basic Syntax:**

**SELECT column1, column2, ... FROM table\_name**

**ORDER BY column1 [ASC|DESC], column2 [ASC|DESC], ...;**

### Examples:

- (a) Sort employees by last name alphabetically

```
SELECT employee_id, first_name, last_name
FROM employees ORDER BY last_name;
```

| employee_id | first_name | last_name |
|-------------|------------|-----------|
| 8           | Jennifer   | Anderson  |
| 5           | David      | Brown     |
| 3           | Michael    | Davis     |
| 2           | Sarah      | Johnson   |
| 6           | Lisa       | Miller    |
| 10          | Jessica    | Moore     |
| 1           | John       | Smith     |
| 7           | Robert     | Taylor    |
| 9           | William    | Thomas    |
| 4           | Emily      | Wilson    |

- (b) Sort employees by salary from highest to lowest

```
SELECT employee_id, first_name, last_name, salary
FROM employees
ORDER BY salary DESC;
```

| employee_id | first_name | last_name | salary   |
|-------------|------------|-----------|----------|
| 7           | Robert     | Taylor    | 90000.00 |
| 10          | Jessica    | Moore     | 88000.00 |
| 9           | William    | Thomas    | 85000.00 |
| 3           | Michael    | Davis     | 82000.00 |
| 5           | David      | Brown     | 79000.00 |
| 1           | John       | Smith     | 75000.00 |
| 6           | Lisa       | Miller    | 70000.00 |
| 2           | Sarah      | Johnson   | 68000.00 |
| 8           | Jennifer   | Anderson  | 64000.00 |
| 4           | Emily      | Wilson    | 62000.00 |

## Sorting by Multiple Columns - ORDER BY CLAUSE

We can sort by multiple columns, creating a hierarchy of sorting criteria:

- a. Sort by department first, then by salary (highest to lowest) within each department

```
SELECT employee_id, first_name, last_name, department, salary
FROM employees
ORDER BY department ASC, salary DESC;
```

| employee_id | first_name | last_name | department  | salary   |
|-------------|------------|-----------|-------------|----------|
| 9           | William    | Thomas    | Engineering | 85000.00 |
| 3           | Michael    | Davis     | Engineering | 82000.00 |
| 5           | David      | Brown     | Engineering | 79000.00 |
| 1           | John       | Smith     | Engineering | 75000.00 |
| 7           | Robert     | Taylor    | Finance     | 90000.00 |
| 10          | Jessica    | Moore     | Finance     | 88000.00 |
| 8           | Jennifer   | Anderson  | HR          | 64000.00 |
| 4           | Emily      | Wilson    | HR          | 62000.00 |
| 6           | Lisa       | Miller    | Marketing   | 70000.00 |
| 2           | Sarah      | Johnson   | Marketing   | 68000.00 |

In this example, MySQL first groups all employees by department alphabetically. Then, within each department, it sorts employees by their salary in descending order.

## Working with Two Tables Using Equi-Join

An equi-join is a type of join operation that combines rows from two tables based on a condition where the values in specified columns are equal. This is one of the most common ways to relate data across tables in a relational database.

### Syntax:

**SELECT \* FROM <table1>, <table2>**

**WHERE table1.column = table2.column;**

Consider below two tables for **Customers** and **Orders** for Join concept.

**Customers Table**

| customer_id | name    | email               | city        |
|-------------|---------|---------------------|-------------|
| 1           | Alice   | alice@example.com   | New York    |
| 2           | Bob     | bob@example.com     | Los Angeles |
| 3           | Charlie | charlie@example.com | Chicago     |
| 4           | Diana   | diana@example.com   | Miami       |

**Orders Table**

| order_id | customer_id | product    | amount  | date       |
|----------|-------------|------------|---------|------------|
| 101      | 1           | Laptop     | 1200.00 | 2023-01-15 |
| 102      | 3           | Smartphone | 800.00  | 2023-01-20 |
| 103      | 1           | Headphones | 150.00  | 2023-02-05 |
| 104      | 2           | Monitor    | 300.00  | 2023-02-10 |
| 105      | 4           | Keyboard   | 80.00   | 2023-02-15 |

**Example 1. To see all orders with customer information**

**SELECT o.order\_id, o.product, o.amount, c.name, c.email, c.city**

**FROM Orders o, Customers c where o.customer\_id = c.customer\_id;**

| order_id | product    | amount  | name    | email               | city        |
|----------|------------|---------|---------|---------------------|-------------|
| 101      | Laptop     | 1200.00 | Alice   | alice@example.com   | New York    |
| 103      | Headphones | 150.00  | Alice   | alice@example.com   | New York    |
| 104      | Monitor    | 300.00  | Bob     | bob@example.com     | Los Angeles |
| 102      | Smartphone | 800.00  | Charlie | charlie@example.com | Chicago     |
| 105      | Keyboard   | 80.00   | Diana   | diana@example.com   | Miami       |

## MULTIPLE CHOICE QUESTIONS

**Q1. Which aggregate function returns the number of rows in a result set, including rows with NULL values?**

- A) COUNT(column)      B) COUNT(\*)      C) SUM(column)      D) AVG(column)

**Answer: B**

**Q2. Which statement is true about the AVG () function?**

- A) It includes NULL values in the calculation    B) It ignores NULL values in the calculation  
C) It treats NULL values as zero      D) It returns NULL if any value in the column is NULL

**Answer: B**

**Q3. Which of the following is NOT a valid aggregate function in MySQL?**

- A) MIN ()      B) SUM()      C) MAX ()      D) MEDIAN()

**Answer: D**

**Q4. If a table has no rows, what will COUNT (\*) return?**

- A) NULL      B) Error      C) 0      D) -1

**Answer: C**

**Q5. What is the difference between COUNT (DISTINCT column) and COUNT(column)?**

- A) COUNT (DISTINCT column) counts only unique values, while COUNT(column) counts all non-NULL values  
B) COUNT (DISTINCT column) counts all values including NULL, while COUNT(column) counts only unique values  
C) They are exactly the same  
D) COUNT (DISTINCT column) always returns a lower count than COUNT(column)

**Answer: A**

**Q6. In a GROUP BY query, which statement is correct?**

- A) You can select only columns that appear in the GROUP BY clause  
B) You can select any column regardless of whether it appears in GROUP BY  
C) You can select columns that appear in GROUP BY or are used in aggregate functions  
D) You can only select aggregate functions

**Answer: C**

**Q7. What is the correct order of clauses in a SQL query that includes GROUP BY?**

- A) SELECT, GROUP BY, FROM, WHERE      B) SELECT, FROM, WHERE, GROUP BY  
C) SELECT, FROM, GROUP BY, WHERE      D) FROM, SELECT, WHERE, GROUP BY

**Answer: B**

**Q8. What is the primary purpose of the HAVING clause?**

- A) To filter individual rows before grouping      C) To specify the columns to be grouped  
B) To filter groups after the GROUP BY has been applied      D) To sort the final result set

**Answer: B**

**Q9. What will the following query return?**

```
SELECT department, COUNT(*) AS employee_count
FROM employees
```

```
GROUP BY department HAVING COUNT(*) > 5;
```

- A) All departments      B) Departments with exactly 5 employees  
C) Departments with more than 5 employees      D) Departments with fewer than 5 employees

**Answer: C**

**Q10. What will happen if we use ORDER BY with a column that contains NULL values?**

- A) NULL values will be sorted first      B) NULL values will be sorted last  
C) NULL values will cause an error      D) NULL values will be excluded from the result

**Answer: A**

**Q11. How many columns can you specify in an ORDER BY clause?**

- A) Only one      B) Maximum of three      C) Maximum of five      D) As many as needed

**Answer: D**

**Q12. What is the result of this query?**

```
SELECT name, department, salary FROM employees ORDER BY department ASC, salary DESC;
```

- A) Results are sorted by salary in descending order, then by department  
B) Results are sorted by department in ascending order, then by salary in descending order  
C) Results are sorted by department in descending order, then by salary in ascending order  
D) Results are sorted by salary in ascending order, then by department

**Answer: B**

**Q13. What is the result of MONTH('2023-07-15')?**

- A) July      B) 7      C) 07      D) 6

**Answer: B**

### **Assertion and Reasoning Based Questions**

Each question consists of an assertion (A) and a reason (R). You need to determine whether each statement is true or false, and if the reason correctly explains the assertion. Options are as follows:

- A) Assertion and Reason both are correct and Reason is correct explanation of assertion  
B) Assertion and Reason both are correct and Reason is not correct explanation of assertion  
C) Assertion is True and Reason is False  
D) Assertion is False and Reason is True

**Q1. Assertion (A):** COUNT(column\_name) and COUNT() always return the same value.

**Reason (R):** Both COUNT(column\_name) and COUNT() count all rows in a table or result set.

**Answer: E**

**Q2 Assertion (A):** The AVG() function returns NULL if all values in the column are NULL.

**Reason (R):** Aggregate functions in MySQL ignore NULL values in their calculations.

**Answer: A**

**Q3 Assertion (A):** The SUM() function always returns a numeric value, even when applied to an empty result set.

**Reason (R):** MySQL aggregate functions return 0 or NULL when applied to empty sets.

**Answer: D**

**Q4 Assertion (A):** The GROUP BY clause in MySQL must include all non-aggregated columns that appear in the SELECT clause.

**Reason (R):** MySQL requires that each column in the SELECT list that is not part of an aggregate function must be included in the GROUP BY clause to ensure deterministic results.

**Answer: A**

**Q5 Assertion (A):** Using GROUP BY on a column with NULL values will place all NULL values into a single group.

**Reason (R):** MySQL treats all NULL values as identical when comparing them for equality.

**Answer: C**

**Q6 Assertion (A):** The COUNT(column\_name) and COUNT(\*) functions can produce different results when used with GROUP BY.

**Reason (R):** COUNT(column\_name) counts only non-NULL values in the specified column, while COUNT(\*) counts all rows regardless of NULL values.

**Answer: A**

**Q7 Assertion (A):** The WHERE and HAVING clauses can be used interchangeably when filtering rows that contain aggregate values.

**Reason (R):** Both WHERE and HAVING filter rows, but they are processed at different stages of query execution.

**Answer: D**

**Q8 Assertion (A):** In MySQL, the default sort order is ascending (ASC) if neither ASC nor DESC is specified.

**Reason (R):** The ASC keyword is implicitly applied when no sort direction is specified to provide a consistent default behaviour.

**Answer: A**

**Q10 Assertion (A):** In MySQL, you can sort by a column that is not included in the SELECT clause.

**Reason (R):** The ORDER BY clause operates independently of the columns listed in the SELECT clause.

**Answer: A**

**Q11 Assertion (A):** When using ORDER BY with NULL values, MySQL sorts NULL values first when using ASC order.

**Reason (R):** MySQL treats NULL as the lowest possible value in the column's data type hierarchy.

**Answer: A**

**Q12 Assertion (A):** The DATE() function extracts the date part from a datetime expression, removing any time component.

**Reason (R):** DATE() truncates the time portion of a datetime value to standardize date comparisons.

**Answer: A**

**Q13 Assertion (A):** In an Equi Join, columns with NULL values will never match, even if both columns have NULL.

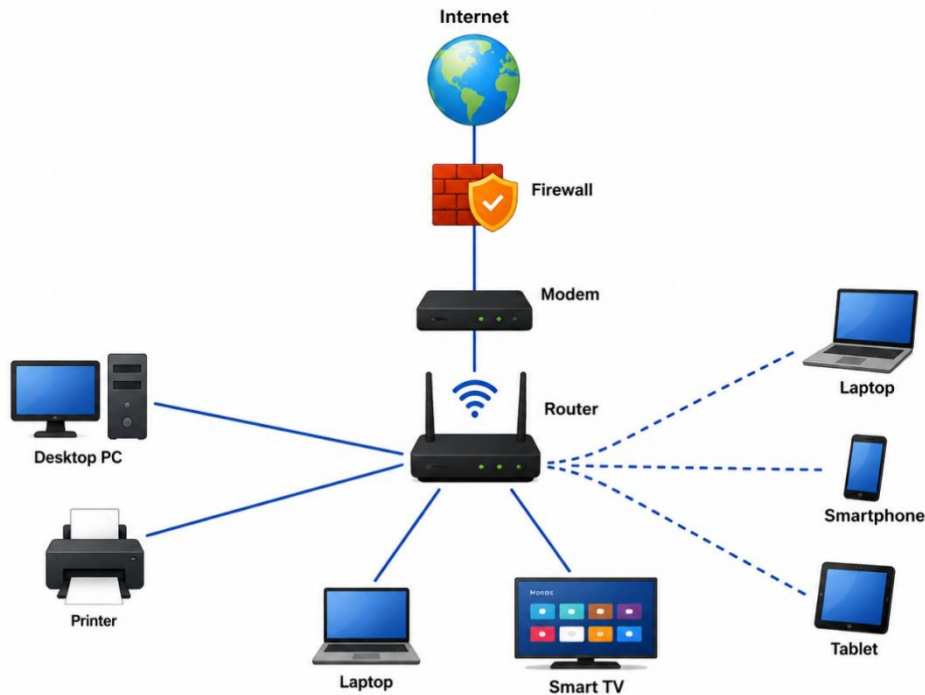
**Reason (R):** In SQL, NULL = NULL evaluates to NULL (unknown), not TRUE, so rows with NULL values in join columns are excluded.

**Answer: A**

## Unit 3: Introduction to Computer Networks

### Introduction to Networks:

A group of two or more autonomous interconnected computers or computing devices is called a computer network. Each computer or device can share data with other devices.



### Advantages of Using Computer Networks:

- Resource sharing: Resources can be any hardware or information or storage space etc.
- More Storage space: Data can be stored on available hard disks in a network.
- Back up of data: Data can be saved on multiple devices in network. And this ensures the availability of data.
- Sharing of computing power and memory: Processes can be distributed across the network and can have more computing power.
- Communication: Users can communicate with anyone through e-mail, chat, etc., and can also transfer files easily and economically.

### Different types of Networks:

Based on geographical area covered and the data transfer rate, the following four types of networks are there.

#### 1. PAN: (Personal Area Network)

Size and Coverage: PAN connects devices such as smartphones, laptop, camera, tablets etc. They are designed for short-distance communication. Most common communication technology is Bluetooth and hence can give a range up to 10 meters.

**Speed and Cost:** PANs are low-cost networks with moderate data speeds suitable for personal device connectivity.

**Example:** A person connecting smartphone, smartwatch, and wireless headphones using Bluetooth.

## 2. LAN: (Local Area Network)

**Size and Coverage:** LANs are limited to a relatively small area, such as a single building, home, office, or school campus or one or two campuses. The term “local” refers to single management. LAN can be wired or wireless. The range can be from 10 meters to 1 KM.

**Speed and Cost:** They offer high data transfer speeds and are cost-effective to set up and maintain. Wired LAN can operate at a speed of 100 Mbps to 1 Gbps. There are LANs which can operate at a speed of 10 Gbps.

**Usage:** Commonly used to connect computers, printers, and other devices within small spaces for sharing resources like files and internet access.

**Example:** A school using a LAN to connect all its computers and share a central server.

## 3. MAN: (Metropolitan Area Network)

**Size and Coverage:** MANs are larger than LANs but smaller than WANs, spanning over a city or two cities. These networks link multiple LANs within the defined territory. They can be extended up to 30 - 40 Km.

**Speed and Cost:** MANs offer faster speeds compared to LANs but are more complex and expensive than LANs.

**Usage:** Often used by governments, universities, and large organizations to connect resources across a city or metropolitan region.

**Example:** A cable TV Network covering a city, Cable based broadband internet service.

## 4. WAN: (Wide Area Network)

**Size and Coverage:** WANs operate over large geographic areas, such as cities, countries, or even continents. The internet is the most common example of a WAN. Different types of networks using various technologies are connected together to form WAN.

**Speed and Cost:** These networks generally have slower data transfer speeds compared to LANs and are more expensive to implement and maintain.

**Usage:** Primarily used to connect multiple LANs and enable global communication.

**Example:** A multinational company connecting branch offices across different countries using a WAN.

**Summary Table: Key Differences**

| Aspect               | PAN                   | LAN                        | MAN                          | WAN                        |
|----------------------|-----------------------|----------------------------|------------------------------|----------------------------|
| <b>Coverage Area</b> | Very small (personal) | Small (building or campus) | Medium (city or campus-wide) | Large (regional or global) |
| <b>Speed</b>         | Moderate              | High                       | Higher than WAN              | Slower than LAN            |
| <b>Cost</b>          | Low                   | Low                        | Moderate to high             | High                       |

|                |                       |                  |                               |                             |
|----------------|-----------------------|------------------|-------------------------------|-----------------------------|
| <b>Purpose</b> | Personal device links | Resource sharing | Connecting LANs across cities | Interconnect large networks |
|----------------|-----------------------|------------------|-------------------------------|-----------------------------|

## Network Devices:

To interconnect computers and other devices to create a computer network and to transfer data we need some devices and these devices are called network devices.

### 1. Network Interface Card (Ethernet Card/Terminal Access Point/ Network Interface Unit):

- This is a network adaptor used to set up a wired network.
- It acts as an interface between the device and the network.
- A network cable (Ethernet cable) connects to this card using an RJ-45 connector.
- They support data transfer between 10 Mbps to 1 Gbps.
- Each NIC has a permanent hardware address called MAC (Media Access Control) Address. MAC addresses are of 48 bits (6 Bytes) and are represented using hexadecimal numbers. MAC address is used to identify the device on the network.
- Example: D4:3D:7E:8A:12:34



### 2. Modem:

- A modem is a device that allows computers, smartphones, tablets, and other devices to connect to the internet. They connect a computer network with a telephone network.
- They convert digital signals from the computer network to analog signals for transmitting it over the telephone network and on receiving the analog signal from the telephone network, it converts them back into digital signals.
- The term 'Modem' stands for 'MODulator DEModulator'.

### 3. Hub (Ethernet Hub):

- This is a device that connects multiple devices (like computers or other network devices) within a local area network (LAN), through wires.
- Multiple ports where ethernet cables can be connected using RJ-45 connectors are available.
- Data received through one port will be broadcasted to all other devices connected.

### 4. Switch:

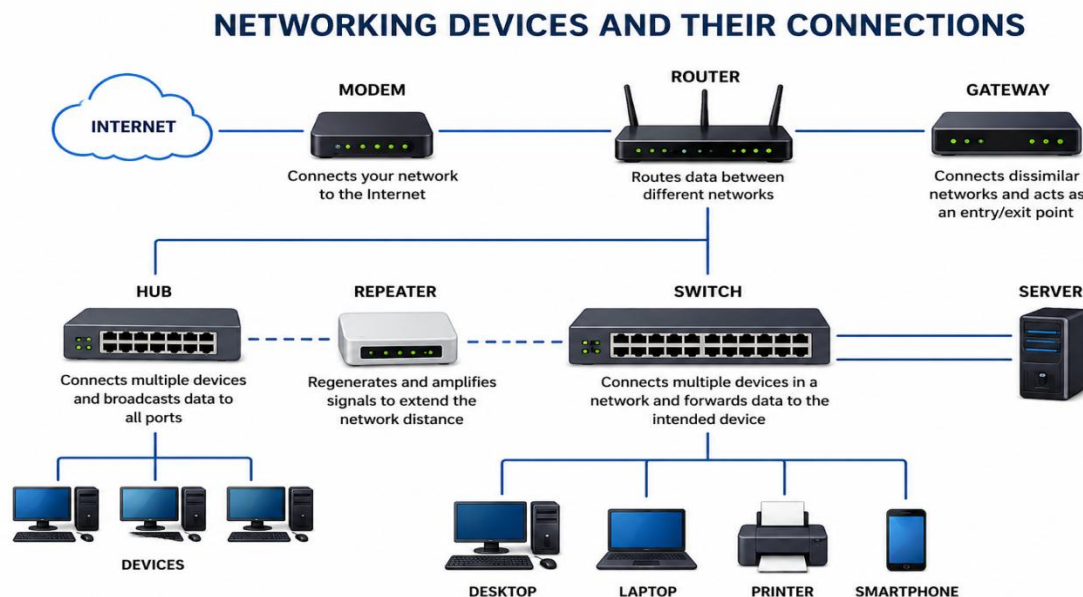
- A switch is a hardware device that connects multiple devices (like computers, printers, and servers) on a network, enabling them to communicate by exchanging data packets.
- A switch initially learns MAC addresses like a hub forwarding packets, but later forwards data only to the intended device.
- It can forward multiple packets at the same time. Also it can transfer data to multiple hosts if required.

## 5.Repeater:

- Data is carried in the form of signals over cables and can typically be transmitted up to 100 meters.
- Repeaters are devices in computer networks used for amplifying or regenerating an incoming signal before retransmitting it so that it reaches the destination or next node.
- They operate at the physical layer of the OSI (Open Systems Interconnection) model

## 6.Router:

- Connects two or more networks and forwards data packets between them.
- They can receive the data, analyse it and transmit it to other networks.
- It uses IP addresses (Internet Protocol addresses used to identify devices or connections in a network).
- A router connects a local area network to the internet.
- It can connect different types of networks using different technologies or protocols.
- It can analyse the data packet received and can decide how to forward it. It can even repack the received packet.
- If the destination is known then it will forward the data packet to the exact destination, otherwise it will be forwarded to the next router connected to it. Router uses a routing table to forward the packet.
- Wireless routers can provide Wi-Fi access.



## 7.Gateway:

- In computer networks, a gateway is a device or software that acts as a bridge between different networks. They connect different types of networks together.
- It acts as an entry and exit point and all data passes through it.

## Network Topologies:

Network topology describes the physical and logical arrangement of nodes (any computer or device connected to a network is called a node) and connections within a network (LAN).

It dictates how data flows and how devices communicate. There are several types of network topologies, including Star, Bus, Tree, Mesh, ring and hybrid. Understanding network topology is crucial for designing, managing, and troubleshooting networks.

### Bus Topology

Each communicating device connects to a transmission medium, known as bus.

A single backbone wire called bus is shared among the nodes.

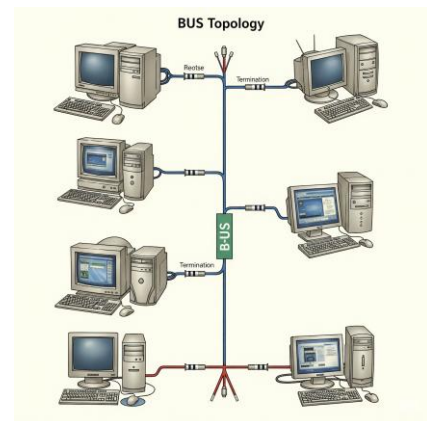
Data can be received by any of the nodes connected to the bus.

Signals will be absorbed by terminators on reaching the end of the bus.

Bus topology is less secure and less reliable.

**Advantages:** Simple to install, inexpensive to implement.

**Disadvantages:** if the bus fails, the entire network is down, limited speed, and security concerns. Difficult to expand beyond a certain limit due to repeater configuration issues.



### Star Topology

Each device connects to a central node (hub or switch)

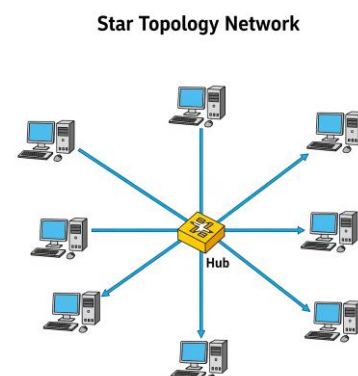
Advantages:

Very effective, efficient and fast as each device is directly connected with the central device.

Easy to troubleshoot and maintain, and scalable.

Disadvantages:

If the central node fails, the entire network will be affected. More expensive than other topologies as more cable is required.

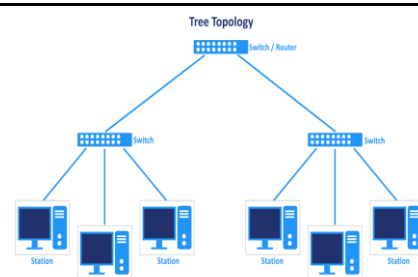


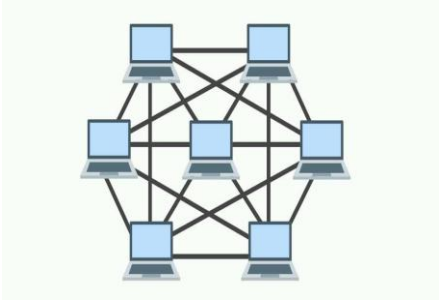
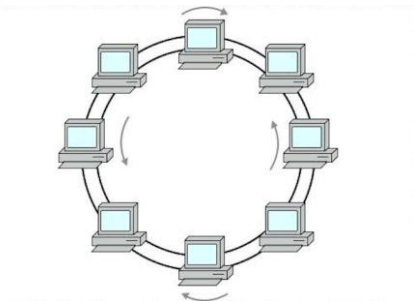
### Tree topology:

Tree topology is a combination of bus and star topologies. Devices are arranged in a hierarchical, tree-like structure, often using a central hub at the root.

This is a hybrid topology.

All the stars are connected together like a bus.



|                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Advantages: Good for hierarchical structures, scalable, and can be used for different types of networks.</p> <p>Disadvantages: More complex than simpler topologies, and can be slower than other options.</p>                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Mesh Topology:</b></p> <p>Each device connects to multiple other devices, creating a mesh of connections.</p> <p>Advantages: Highly reliable, fault-tolerant, and scalable.</p> <p>Disadvantages: Complex to install and manage, and can be expensive due to the number of connections.</p>                                                            |  <p>The diagram illustrates a mesh topology with eight computer icons arranged in a 3x3 grid (with the bottom-right position empty). Every icon is connected to its immediate horizontal, vertical, and diagonal neighbors, resulting in a dense web of connections.</p> |
| <p><b>Ring Topology:</b></p> <p>Each node(device) is connected to exactly two other adjacent nodes and forms a ring(closed loop)</p> <p>Advantages: Simple architecture, data can be transmitted efficiently in one direction.</p> <p>Disadvantages: Single point of failure, can be difficult to troubleshoot, and not as scalable as other topologies.</p> |  <p>The diagram shows a ring topology with eight computer icons connected in a single closed loop. Arrows on the connecting lines indicate a consistent clockwise direction of data flow throughout the entire network.</p>                                             |

## Communication Media

The medium through which the signals are transferred is called communication media. It can be Guided or Unguided.

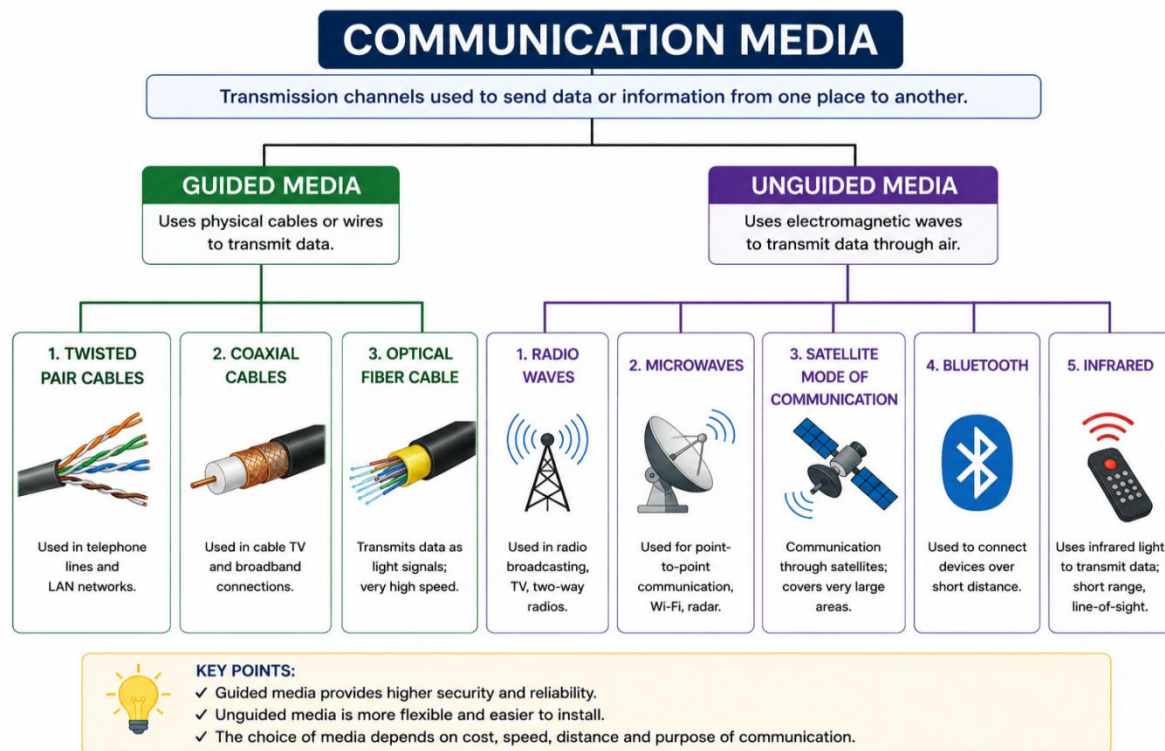
### 1.Guided Media (Wired Media):

**Twisted pair Cables:** Twisted pair cables allow the user to connect their devices to a Local Area Network (LAN). There are 8 wires or 4 pairs of wires with each pair twisted together in the cable.

**Coaxial Cables:** A coaxial cable is used to carry high-frequency signals with low losses. Its maximum transmission speed is 10 Mbps. It is usually used in telephone systems, cable TV, etc.

**Optical Fiber Cable (OFC):** Optical Fiber Cables use optical fibers and transmit data in the form of light signals due to which there are no electromagnetic interference in fiber optics. Fiber optics can transmit signals over a very long distance as compared to twisted pairs or coaxial cables.

**2.Unguided Media (Wireless Media):** It includes electromagnetic waves of different frequencies. Different types of unguided media are: Radio Waves, Microwaves, Satellite mode of communication, Bluetooth and Infrared communication.



## Introduction to Internet:

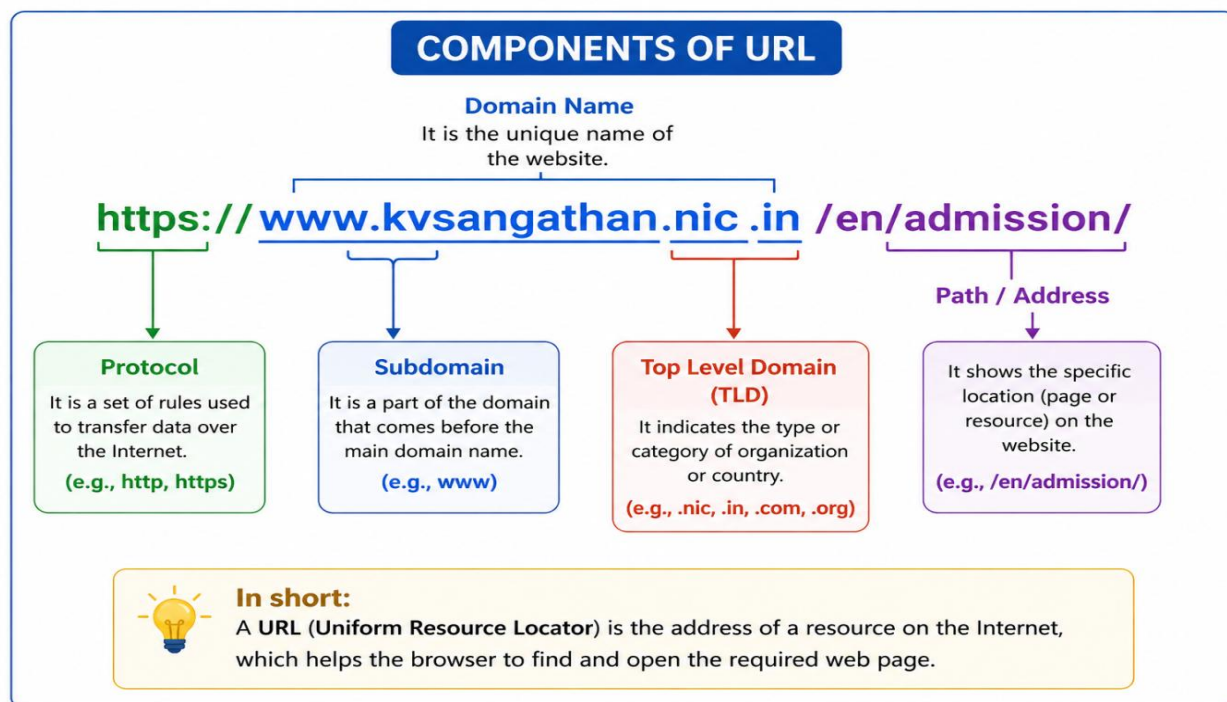
The Internet is the network of all the networks spread across the globe. Different types of networks are interlinked. Devices/networks are connected to the Internet Service Provider's (ISP) network. ISP's networks are connected to form regional networks and regional networks are connected to form national networks. Such country wise networks are connected to form the internet.

**URL:** URL is Uniform Resource Locator and provides the location and mechanism (protocol) to access the resource. It is also called a web address. It consists of the following:

1. Protocol - set of rules to access the resource and Examples include http, https, ftp, telnet etc
2. Domain name - the name given to the website. Example: ncert.nic.in
3. Path to the resource - based on the web server.
4. Name of the resource.

### Examples for URL:

1. <https://cbseacademic.nic.in/>
2. <https://ncert.nic.in/textbook.php>
3. <http://www.ncert.nic.in/textbook/textbook.htm>



### Applications of Internet:

Some of the applications of internet are:

1)**World wide web (WWW)**: www is the collection of interlinked web pages and web resources which can be accessed through the internet. Sir Tim Berneres Lee is considered as the father of www. Three fundamental technologies that lead to creation of web: HTML (HyperText Markup Language) used to design the web page and present the content, URI (Uniform Resource Identifier) to identify a resource located on the web, HTTP (HyperText Transfer Protocol) the set of rules used to retrieve linked web pages.

2)**Electronic mail (E-mail)**: An email can be sent anytime to any number of recipients anywhere. Files can be attached with email. To use email service users must register with an email service provider. Gmail and Outlook are examples for email service providers.

3)**Chat**: It is for real time messages. Applications such as WhatsApp, Slack, Skype, YahooMessenger, Google Talk, Facebook Messenger, Google Hangout, etc., are examples of instant messengers.

4)**Voice over Internet Protocol (VoIP)** - VoIP allows us to have voice calls over the internet. It is also known as Internet Telephony or Broadband Telephony.

### Website:

A website is a collection of web pages linked through hyperlinks, and saved on a web server. Hyperlinks connect the pages together. To access a website URL is required. A web page is usually a part of a website and may contain information in the forms of texts, images, audio and video etc. The first page of the website is called Home page.

The basic structure of a web page is created using HTML. To make web pages more

attractive, CSS (Cascaded Style Sheets) sheet is used. To make the pages interactive scripts are used. A website's purpose is to make the information available to all at any time.

Depending on the functionality and features, a web page may be classified as-

**Static Web Page:** A static webpage is one whose content always remains the same(static), i.e., does not change based on person, location or device. Static web pages are generally created using HTML, CSS and have the extension .htm or .html. Content can be manually modified by the administrator of such a website.

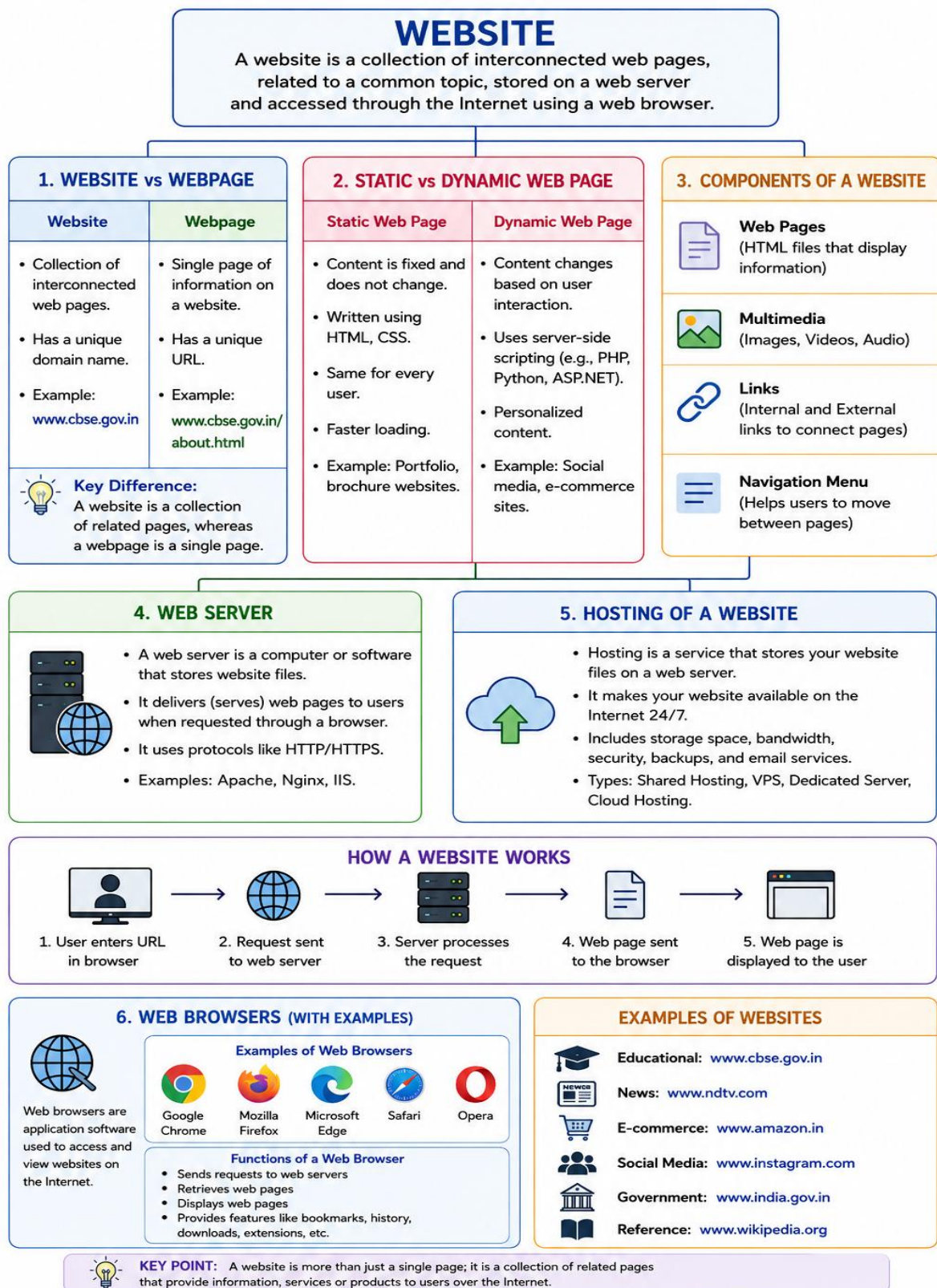
**Dynamic Web Page:** A dynamic web page is one in which the content of the web page can be different for different users according to users' response, location or device. The dynamic websites are more complex in design and take more time to load than static web pages. Dynamic web pages can be created using scripting languages such as JavaScript, PHP, ASP.NET, Python etc. Web pages displaying the date, time, weather report, multilingual pages or auto resizing webpage as per screen size of the client device are Dynamic web pages.

#### Static V/s Dynamic Web Page

| Static Webpage                                                                                                                                                           | Dynamic Web page                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No Change in contents until someone changes it manually.<br>HTML and CSS can be used to create such pages<br>It takes less time to display on the browser at client end. | Web page changes its appearance or contents according to user, location or device.<br>Needs scripts to create the pages.<br>It takes more time to display on the browser at client end. |

**Web Server:** A web server is used to store and deliver the contents of a website. Web server is implemented using software. The content of the website along with the required scripts are saved in the web server. Web server as a software, is a specialized program that understands URLs and receives requests from browsers, and responds to those requests.

Examples for Web server: Apache web server, Nginx, Microsoft IIS.



## Web Hosting:

It is a service that enables us to publish websites on the Internet. After creating a web site, it needs to be placed on a web server for global access. Generally, Web Server services (CPU, RAM, and storage etc.) are taken on rent basis from the service providers. Web developers host websites on a server by uploading the files constituting the website (HTML, CSS, JavaScript, images, databases, etc.).

All web servers are identified by a unique numeric address called IP address, and this IP address needs to be mapped to domain name (Website name/URL) of the website using DNS (Domain Name System) Server. By this mechanism the IP address corresponding to a domain name can be identified.

### **Web Browser:**

Browser is used to view/access the web page using URL. Browser sends a request to the server and receives the response from the server.

Commonly used Browsers: Google chrome, Mozilla Firefox and Microsoft Edge.

### **Browser Settings:**

Browser settings are configuration options in a web browser (like Chrome, Firefox, Edge) that allow users to control how the browser behaves — from privacy and security to appearance and performance.

### **Add-ons and Plug-ins:**

Add-ons and plug-ins are the tools that help to extend the functionality of the web browser. An add-on is also called extension in some browsers and is used to add a particular functionality to the browser. Mostly these Add-ons are provided as Extensions through a library provided by the Web Browser which can be installed from the browsers setting options. Google Translate and Grammarly are examples of Add-ons.

A plug-in is a complete program or third-party software which offers some extra functionality to users. For example, Flash players and Java are plug-ins etc. A Flash player is required to play a video in the browser. A plug-in is a software that is installed on the host computer and can be used by the browser for multiple functionalities and can even be used by other applications as well.

**Cookies:** A cookie is a small text file, which is transferred by the webserver to the browser while surfing a website. The information stored in cookies are related to the user, pages visited, choices and menu(s) settings on a particular website. It helps in customizing the web pages like language, auto-login information, preferences and sometimes remembering the shopping preference and displaying advertisements of interest, etc.

Cookies are usually harmless and they can't access information from the hard disk or transmit virus or malware. However, cookies may be privacy threats. Sometimes viruses can also be tricked as cookies and cause harm to a computer system. Cookies can be disabled by changing the Privacy and Security settings of the browser.

## **MULTIPLE CHOICE QUESTIONS**

|   |                                                                                                                                                                                                                  |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>1. Which of the following networks typically covers the smallest geographical area?</b><br>A) WAN                      B) MAN                      C) LAN                      D) PAN<br>Answer: D) PAN       |
| 2 | <b>A network that connects computers within a city using high-speed connections is known as:</b><br>A) LAN                      B) PAN                      C) WAN                      D) MAN<br>Answer: D) MAN |
| 3 | <b>Which type of network would most likely be used in a school or college campus?</b><br>A) PAN                      B) LAN                      C) MAN                      D) WAN<br>Answer: B) LAN            |

|                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4                                                                                                                                                                                                                                          | <b>What type of network is the internet an example of?</b><br>A) PAN                      B) LAN                      C) WAN                      D) MAN<br>Answer: C) WAN                                                                                                        |
| 5                                                                                                                                                                                                                                          | <b>Bluetooth devices such as wireless headsets typically form which type of network?</b><br>A) PAN                      B) LAN                      C) WAN                      D) MAN<br>Answer: A) PAN                                                                          |
| 6                                                                                                                                                                                                                                          | <b>What is the primary function of an Ethernet card in a computer?</b><br>A) Display graphics                      B) Connect to the internet wirelessly<br>C) Enable network communication                      D) Store data<br>Answer: C) Enable network communication         |
| 7                                                                                                                                                                                                                                          | <b>Which device is used to connect multiple networks and route data between them?</b><br>A) Switch                      B) Router                      C) Hub                      D) Repeater<br>Answer: B) Router                                                               |
| 8                                                                                                                                                                                                                                          | <b>Which network device only regenerates and amplifies the signal to extend network range?</b><br>A) Switch                      B) Router                      C) Repeater                      D) Gateway<br>Answer: C) Repeater                                                |
| 9                                                                                                                                                                                                                                          | <b>A device that connects networks using different protocols is known as:</b><br>A) Bridge                      B) HUB                      C) Repeater                      D) Gateway<br>Answer: D) Gateway                                                                     |
| 10                                                                                                                                                                                                                                         | <b>Which network device blindly broadcasts incoming signals to all its ports?</b><br>A) Switch                      B) Hub                      C) Router                      D) Gateway<br>Answer: B) Hub                                                                       |
| 11                                                                                                                                                                                                                                         | <b>Which device is best for reducing network traffic by sending data only to the destination device?</b><br>A) Hub                      B) Router                      C) Repeater                      D) Switch<br>Answer: D) Switch                                            |
| 12                                                                                                                                                                                                                                         | <b>What is the primary function of a modem?</b><br>A) Store data permanently<br>B) Convert digital signals to analog and vice versa<br>C) Provide electricity to network devices<br>D) Route data between networks<br>Answer: B) Convert digital signals to analog and vice versa |
| 13                                                                                                                                                                                                                                         | <b>The term "modem" is a combination of which two operations?</b><br>A) Multiplexing and Demultiplexing<br>B) Modulation and Demodulation<br>C) Modeling and Demonstration<br>D) Modifying and Demanding<br>Answer: B) Modulation and Demodulation                                |
| <b>Assertion and Reasoning Based Questions</b>                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                   |
| Choose the correct option:<br>A. Both A and R are true, and R is the correct explanation of A.<br>B. Both A and R are true, but R is NOT the correct explanation of A.<br>C. A is true, but R is false.<br>D. A is false, but R is true. ` |                                                                                                                                                                                                                                                                                   |

|    |                                                                                                                                                                                                                                                                                                                                  |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | <p><b>Assertion (A):</b> A website is a collection of related webpages linked together under a domain name.</p> <p><b>Reason (R):</b> A webpage is the homepage of a website.</p> <p>Answer: C. A is true, but R is false.</p>                                                                                                   |
| 2  | <p><b>Assertion (A):</b> A static web page always displays the same content for every visitor.</p> <p><b>Reason (R):</b> Static web pages are generated in real-time by server-side programs.</p> <p>Answer: C. A is true, but R is false.</p>                                                                                   |
| 3  | <p><b>Assertion (A):</b> Dynamic web pages change content based on user interaction or other factors.</p> <p><b>Reason (R):</b> Dynamic web pages are usually connected to databases and use server-side scripting languages.</p> <p>Answer: A. Both A and R are true, and R is the correct explanation of A.</p>                |
| 4  | <p><b>Assertion (A):</b> A web server delivers web content to users upon request via a web browser.</p> <p><b>Reason (R):</b> A web server can only host a single website at a time.</p> <p>Answer: C. A is true, but R is false.</p>                                                                                            |
| 5  | <p><b>Assertion (A):</b> Hosting a website means storing its files on a server that is accessible via the internet.</p> <p><b>Reason (R):</b> Hosting is necessary for a website to be available publicly.</p> <p>Answer: A. Both A and R are true, and R is the correct explanation of A.</p>                                   |
| 6  | <p><b>Assertion (A):</b> A web browser is used to retrieve and display content from the World Wide Web.</p> <p><b>Reason (R):</b> A web browser is only required for sending emails.</p> <p>Answer: A is true, but R is false.</p>                                                                                               |
| 7  | <p><b>Assertion (A):</b> Add-ons and plug-ins are used to extend the functionality of a web browser.</p> <p><b>Reason (R):</b> Add-ons and plug-ins help improve user experience by adding extra features like ad-blockers or video players.</p> <p>Answer: A. Both A and R are true, and R is the correct explanation of A.</p> |
| 8  | <p><b>Assertion (A):</b> Cookies help websites remember users and their preferences.</p> <p><b>Reason (R):</b> Cookies are files stored on the user's device by web browsers.</p> <p>Answer: A. Both A and R are true, and R is the correct explanation of A.</p>                                                                |
| 9  | <p><b>Assertion (A):</b> Cookies can make browsing more convenient but also raise privacy concerns.</p> <p><b>Reason (R):</b> Cookies automatically delete themselves immediately after a session ends.</p> <p>Answer: C. A is true, but R is false.</p>                                                                         |
| 10 | <p><b>Assertion (A):</b> Every website must have at least one webpage.</p> <p><b>Reason (R):</b> A website is the digital address where you store photos only.</p> <p>Answer: C. A is true, but R is false.</p>                                                                                                                  |

### Short Questions with Answers

1 How a homepage in a website beneficial for users?

**Answer:** The homepage is the first page of a website that opens when the website is accessed. It usually contains links to other pages on the site.

|                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>2.Explain the behaviour of dynamic web page? Give one situation where it is used.</p> <p><b>Answer:</b> A dynamic web page changes content based on user interaction or other factors.It is used in online shopping websites to display products based on user search.</p> |
| <p>3.List any two differences between static and dynamic web pages.</p> <p><b>Answer:</b> Static pages display fixed content; dynamic pages display changing content. Static pages are faster to load; dynamic pages require server-side processing.</p>                      |
| <p>4.What is a web browser? Name any two commonly used browsers.</p> <p><b>Answer:</b> A web browser is a software application used to access and display web pages. Examples: Google Chrome, Mozilla Firefox.</p>                                                            |
| <p>5.How can a user manage or delete cookies from a web browser?</p> <p><b>Answer:</b> A user can manage or delete cookies through the browser's privacy settings, under the "Clear browsing data" or "Cookies and site data" section.</p>                                    |
| <p>6.What is the primary function of a hub in a network?</p> <p><b>Answer:</b> A hub connects multiple computers in a LAN and broadcasts data to all connected devices.</p>                                                                                                   |
| <p>7.How does a switch differ from a hub?</p> <p><b>Answer:</b> Unlike a hub, a switch sends data only to the specific device it is intended for, improving network efficiency.</p>                                                                                           |
| <p>8.What is a router used for in a network?</p> <p><b>Answer:</b> A router connects different networks together and directs data between them, often linking a local network to the internet.</p>                                                                            |
| <p>9.What is the main role of a gateway in a network?</p> <p><b>Answer:</b> A gateway acts as a translator between two different network protocols, enabling communication between dissimilar networks.</p>                                                                   |
| <p>10.What does a modem do?</p> <p><b>Answer:</b> A modem converts digital signals to analog (and vice versa) to enable internet access over telephone or cable lines.</p>                                                                                                    |
| <p>11.What is a network card?</p> <p><b>Answer:</b> A network card (NIC - Network Interface Card) is hardware that connects a computer to a network.</p>                                                                                                                      |
| <p>12.What is a MAC address?</p> <p><b>Answer:</b> A MAC (Media Access Control) address is a unique physical address assigned to a device's network. A MAC address is 48 bits long.</p>                                                                                       |
| <p>13.What is the difference between a MAC address and an IP address?</p> <p><b>Answer:</b> A MAC address is a hardware identifier, while an IP address is a logical identifier used for locating devices on a network.</p>                                                   |
| <p>14.Why is DNS important in the internet?</p> <p><b>Answer:</b> DNS allows users to access websites using easy-to-remember domain names instead of numerical IP addresses.</p>                                                                                              |
| <p>15.What is a network topology?</p> <p><b>Answer:</b> Network topology refers to the physical or logical layout of devices and cables in a computer</p>                                                                                                                     |
|                                                                                                                                                                                                                                                                               |

## Long Answer Questions:

1.Explain the concept of a Website and a Webpage. Differentiate between the two with examples.

**Answer:** A website is a collection of interlinked webpages hosted under a single domain name. It is stored on a web server and can be accessed over the Internet.  
Example: www.cbse.gov.in

A webpage is a single page of a website. It is a document that can be viewed using a browser.  
Example: The "Results" page of the CBSE website.

2. What is the difference between a static web page and a dynamic web page? Give suitable examples.

**Answer:** Static Web Page: A static webpage is a page that shows the same content to all users every time it is accessed. It is created using HTML and CSS only.

Example: A company's contact page.

Dynamic Web Page:

A dynamic webpage shows different content and allows user interaction based on inputs or preferences. It is created using server-side scripting languages like PHP, ASP.NET, or database systems. Example: An online shopping website's product page.

3. What is a web server? What is web hosting? Explain their importance in making a website available online.

**Answer:** A web server is software that stores website files (HTML, CSS, images, scripts etc) and delivers them to users over the Internet when requested.

Web hosting refers to a service that provides storage space on a web server to make a website accessible through the Internet.

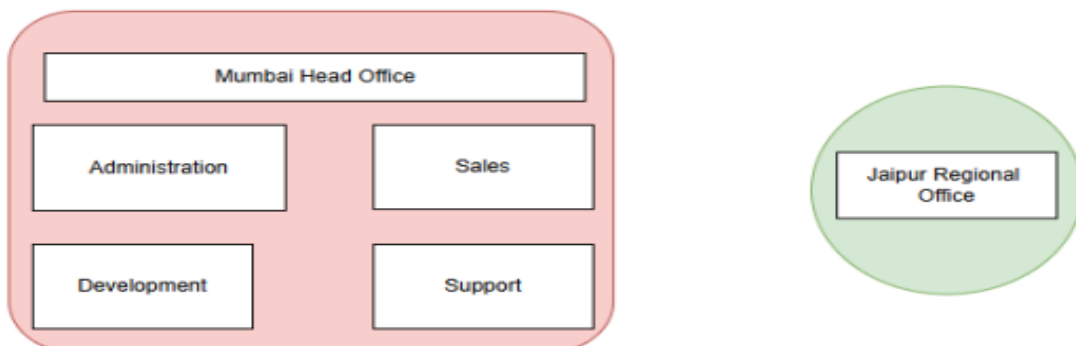
Importance:

- A. Without web servers, users cannot access webpages.
- B. Hosting makes sure the website is always available to users globally.
- C. Hosting services also offer security, backups, and technical support for websites.

Example: 1.web servers: Apache, Nginx      2. Hosting services: GoDaddy, Bluehost

## Case Study Based Questions

ABC Pvt Ltd. is a leading global IT solutions provider. The company's head office is located in Mumbai while its Regional Office is in Jaipur. The Mumbai office consists of four departments: Administration, Sales, Development, and Support.



The distances between these departments, as well as between Mumbai and Jaipur, are as follows:

|                                |                 |
|--------------------------------|-----------------|
| Administration to Sales        | 60 meters       |
| Administration to Development  | 90 meters       |
| Administration to Support      | 120 meters      |
| Sales to Development           | 50 meters       |
| Sales to Support               | 70 meters       |
| Development to Support         | 45 meters       |
| Mumbai Office to Jaipur Office | 1400 kilometers |

The number of computers in each department/office is as follows:

|                |     |
|----------------|-----|
| Administration | 120 |
| Sales          | 40  |
| Development    | 70  |
| Support        | 25  |
| Jaipur Office  | 50  |

As a network engineer, you have to propose solutions for various queries listed from I to V.

I. Suggest the most suitable department in the Mumbai Office Setup, to install the server.

Also, give a reason to justify your suggested location.

II. Draw a suitable cable layout of wired network connectivity between the departments in the Mumbai Office.

III. Which hardware device will you suggest to connect all the computers within each department?

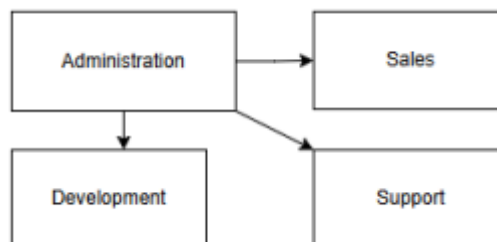
IV. Suggest the most appropriate type of network (LAN, MAN, WAN) to connect the Mumbai Head Office and Jaipur Regional Office.

V. When a signal is transmitted through a wire from Administration department to Support department, its strength reduces. Which device would you suggest the company use to solve this problem?

**Answer:**

I. The server should be installed in the Administration department as it has the most number of computers.

II. Cable Layout



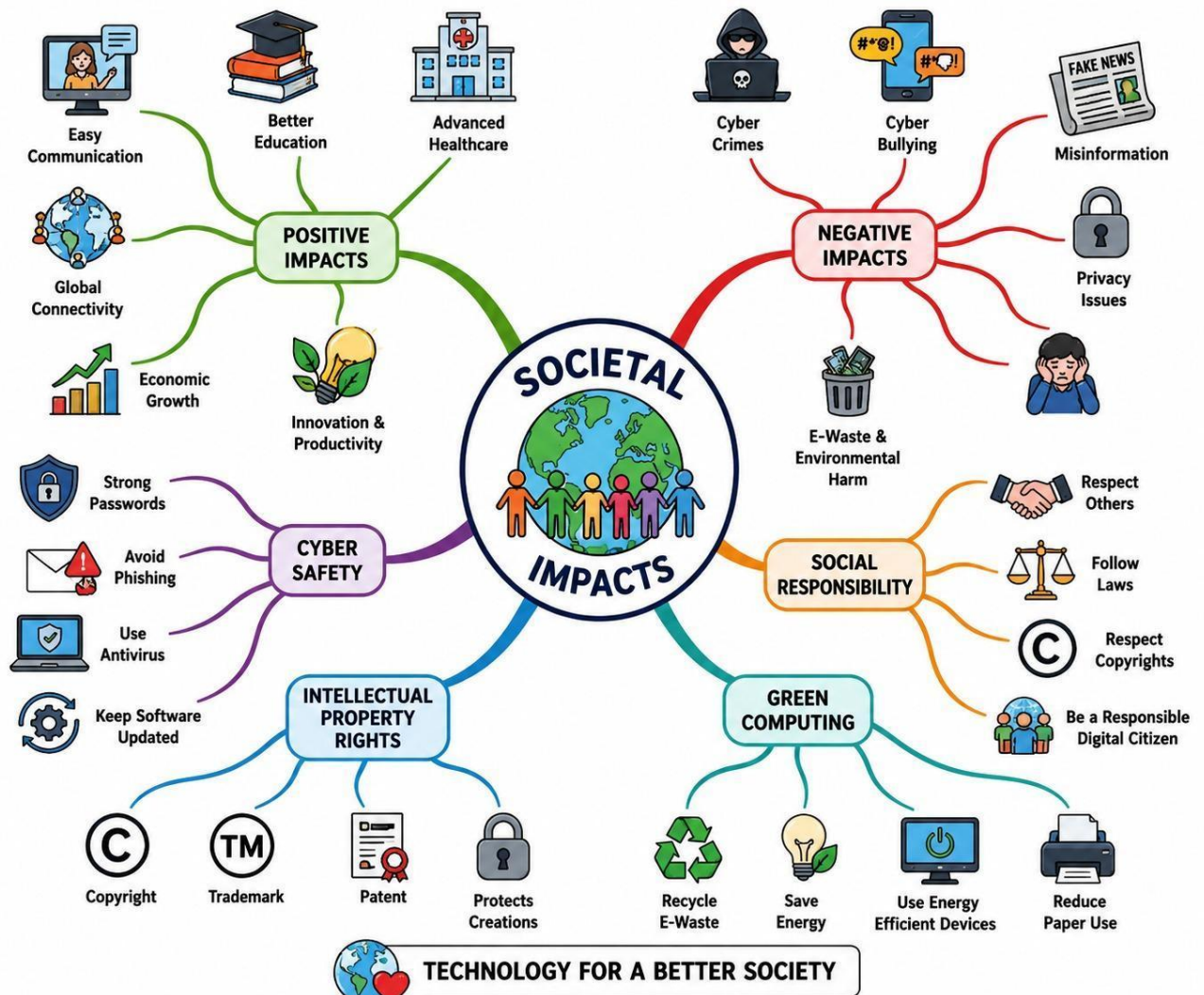
III. Switch/Hub

IV. WAN (Wide Area Network), as the offices are located in different cities.

V. Repeater

## Unit 4: Societal Impact

### Concept Map:



### Digital Footprint

A digital footprint, is the data you leave behind when you use the internet. It includes the websites you visit, emails you send, and information you submit to online services and can be traced back by an individual.

It is of two types: i) Passive digital footprints      ii) Active digital footprints

#### i) Passive digital footprints:

A passive digital footprint refers to the unknowing data trail an individual leave behind while online. Example: Your search history, which is saved by some search engines while you are logged in.

#### ii) Active digital footprints:

Active digital footprints: An "active digital footprint" includes data that you intentionally submit online.

Example: Publishing a blog and posting social media updates are another popular way to expand your digital footprint. Every tweet you post on Twitter, every status update you publish on Facebook, and every photo you share on Instagram contributes to your digital footprint.

How to reduce the footprint?

1. Double-check privacy settings
2. Logout after you're done surfing a website
3. Think before putting anything online/public platform
4. Don't post personal information online

## **Net and Communication Etiquettes**

Net Etiquettes:

One should be ethical, respectful and responsible while surfing the Internet.

### **A) Be Ethical**

- No copyright violation: we should not use copyrighted materials without the permission of the creator or owner. As an ethical digital citizen, we need to be careful while streaming audio or video or downloading images and files from the Internet.

- Share the expertise: it is good to share information and knowledge on Internet so that others can access it. However, prior to sharing information, we need to be sure that we have sufficient knowledge on that topic. The information shared should be true and unambiguous. Also, in order to avoid redundant information, we should verify that the information which we are going to post, is not available already on Internet.

### **B) Be Respectful**

- Respect privacy: as good digital citizens we have the right to privacy and the freedom of personal expression. We should respect this privacy and should not share images, documents, files, etc., with any other digital citizen without each other's consent.
- Respect diversity: in a group or public forum, we should respect the diversity of the people in terms of knowledge, experience, culture and other aspects.

### **(C) Be Responsible**

- Avoid cyber bullying: Cyberbullying means sending, posting, or sharing negative, harmful, false, or mean content about someone else. It implies repeatedly targeting someone with intentions to hurt or embarrass.

- Don't feed the troll: An Internet troll is a person who deliberately shows discord on the Internet by starting quarrels or upsetting people, by posting inflammatory or off topic messages in an online community, just for amusement. When encountering trolls we can ignore them block them and can report to the platform.

## **Communication Etiquettes**

Digital communication includes email, texting, instant messaging, talking on the cell phone, audio or video conferencing, posting on forums, social networking sites, etc. All these are great ways to connect with people in order to exchange ideas, share data and knowledge. Good communication over email, chat room and other such forums require a digital citizen to abide by the communication etiquettes

### **(A) Be Precise**

- Respect time: We should not waste precious time in responding to unnecessary emails or comments unless they have some relevance for us. Also, we should not always expect an instant response as the recipient may have other priorities.

- Respect data limits: For concerns related to data and bandwidth, very large attachments may be avoided. Rather send compressed files or link of the files through cloud shared storage like Google Drive, Microsoft OneDrive, Yahoo Dropbox, etc.

### **(B) Be Polite**

Whether the communication is synchronous (happening in real time like chat, audio/video calls) or asynchronous (like email, forum post or comments), we should be

polite and non-aggressive in our communication. We should avoid being abusive even if we don't agree with others' point of view.

### **(C) Be Credible**

We should be cautious while making a comment, replying or writing an email or forum post such acts decide our credibility over a period of time.

### **Data Protection:**

Data protection refers to the practices, safeguards, and binding rules put in place to protect your personal information and ensure that you remain in control of it.

In short, you should be able to decide whether you want to share some information or not, who has access to it, for how long, for what reason, and who be able to modify some of this information Personal data is any information relating to you, whether it relates to your private, professional, or public life.

### **Sensitive data:**

Elements of data that can cause substantial harm, embarrassment, inconvenience and unfairness to an individual, if breached or compromised, is called sensitive data.

Examples of sensitive data include biometric information, health information, financial information, or other personal documents, images or audios or videos.

Privacy of sensitive data can be implemented by encryption, authentication, and other secure methods to ensure that such data is accessible only to the authorised user and is for a legitimate purpose.

### **Intellectuals Property Rights (IPR)**

Intellectual property refers to intangible property that has been created by individuals and corporations for their benefit or usage such as copyright, trademark, patent and digital data.

It is therefore unethical to copy or steal the creativity and efforts of someone else.

Intellectual property is divided into categories which are-

1. Industrial property which majorly speaks about protecting inventions on the other hand.
2. Copyright majorly protects literary and artistic works.

### **Violation of IPR**

Violation of intellectual property right may happen in one of the following ways:

#### **(A) Plagiarism**

Presenting someone else's idea or work as one's own idea or work is called plagiarism.

Plagiarism means not giving authors credit after copying that author's work. It involves lying, cheating, theft and dishonesty.

For example, copying papers written by other people and professionals and claiming it as written by you can be an example of plagiarism.

If we copy some contents from the Internet, but do not mention the source or the original creator, then it is considered as an act of plagiarism. Further, if someone derives an idea or a product from an already existing idea or product, but instead presents it as a new idea, then also it is plagiarism

It can be classified as:

- i) Accidental/unintentional
- ii) Deliberate/intentional

Accidental/unintentional Plagiarism: Involves careless paraphrasing (changing the words or sentence construction of a copied document), quoting text excessively along with poor documentation. Accidental Plagiarism cases are less serious whereas Deliberate/intentional Plagiarism: Includes copying someone else's work, cutting and passing blocks of text or any kind of information from electronic sources without the permission of the original author. Deliberate plagiarism that may result in serious implications.

#### HOW TO AVOID PLAGIARISM?

Plagiarism should be avoided by the following simple measures:

- i) Use your own ideas and words.
- ii) Always provide a reference or give credit to the source from where you have received information.
- iii) Cite the name of the website, a URL or the name of authors, and acknowledge them if you have used their work after rearranging the order of a sentence and changing some of the work.
- iv) Take the information in the form of bulleted notes in your words.
- v) Use online tools to check for plagiarism.
- vi) Develop your writing skills.

#### **(B) Copyright Infringement**

Copyright infringement is when we use another person's work without obtaining their permission to use it or we have not paid for it, if it is being sold.

Suppose we download an image from the Internet and use it in our project. But if the owner of the copyright of the image does not permit its free usage, then using such an image even after giving reference to the image in our project is a violation of copyright.

#### **(C) Trademark Infringement**

Trademark Infringement means unauthorised use of other's trademark on products and services

#### **Licensing of intellectual property:**

Copyright, Patent and Trademark,

1. Code of the software will be protected by a copyright
2. Functional expression of the idea will be protected by a patent
3. The name and logo of the software will come under a registered trademark

#### **(A) Copyright**

Copyright grants legal rights to creators for their original works like writing, photograph, audio recordings, video, sculptures, architectural works, computer software, and other creative works like literary and artistic work. Copyrights are automatically granted to creators and authors.

#### **(B) Patent**

A patent is usually granted for inventions. Unlike copyright, the inventor needs to apply (file) for patenting the invention. When a patent is granted, the owner gets an exclusive right to prevent others from using, selling, or distributing the protected invention. Patent gives full control to the patentee to decide whether or how the invention can be used by others. Thus, it encourages inventors to share their scientific or technological findings with others. A patent protects an invention for 20 years, after which it can be freely used.

### **(C) Trademark**

Trademark includes any visual symbol, word, name, design, slogan, label, etc., that distinguishes the brand or commercial enterprise, from other brands or commercial enterprises. For example, no company other than Nike can use the Nike brand to sell shoes or clothes.

### **Licensing and copyright**

A Software license is a legal permission or right to use or redistribution of that software. The software can run on a certain number of computers as per license agreement.

### **PROPRIETARY LICENSES**

Exclusive rights in the software are retained with the owner /developer /publisher. They reserve all the freedom and rights to use and distribute this proprietary software.

### **PERMISSIVE LICENSES**

Permissive licenses provide a royalty-free license to do virtually anything with the source code.

They permit using, copying, modifying, merging, publishing, distributing, sublicense and/or selling, but distribution can only be made without the source code as source code modifications can lead to permissive license violation. Distribution and modification of source code is permitted.

#### **Example:**

General Public License (GPL),  
Creative Commons License (CC),  
Lesser General Public License (LGPL),  
Mozilla public License (MPL) etc.

### **COPYRIGHT**

It is a form of protection given to the authors of “original works of authorship”. This is given in the field of literature, dramatics, music, software, art etc. This protection applies to published as well as unpublished work.

Software copyright is used by software developers and proprietary software companies to prevent the unauthorized copying of their software. Free and open source licenses also rely on copyright law to enforce their terms. Copyright protects your software from someone else copying it and using it without your permission. When you hold the copyright to software, you can-

- i) Make copies of it.
- ii) Distribute it.
- iii) Modify it

### **Public Access and Free and Open Source Software (FOSS)**

Public License: The GNU General Public License (GPL) and the Creative Commons (CC) are two popular categories of public licenses.

**Freeware:** Freeware is software that is free to use and doesn't require a paid license. It also doesn't have expiration dates on how many times it can be downloaded.

Example: skype, Adobe Acrobat reader, VLC etc.

**Proprietary software:** Proprietary software that we use are sold commercially and their program code (source code) are not shared or distributed.

Example: Microsoft Windows, iTunes, Adobe Photoshop, Skype, Microsoft Excel, Adobe Acrobat, AutoCAD, and SOLIDWORKS.

**Free and Open Source Software (FOSS):** It is available freely for anyone and their source

code is also open for anyone to access, modify, correct and improve.

For example, Linux kernel-based operating systems like Ubuntu and Fedora come under FOSS. Some of the popular FOSS tools are office packages, like LibreOffice, browsers like Mozilla Firefox, etc.

**Software Piracy:** Software piracy is the unauthorised use or distribution of software. Those who purchase a license for a copy of the software do not have the rights to make additional copies without the permission of the copyright owner. It amounts to copyright infringement regardless of whether it is done for sale, for free distribution or for copier's own use.

Adverse Effects of using pirated software:

1) Use of pirated software not only degrades the performance of a computer system, but also affects the software industry which in turn affects the economy of a country.

### **Creative Commons:**

CC is used for all kind of creative works like websites, music, film, literature, etc. CC enables the free distribution of an otherwise copyrighted work. It is used when an author wants to give people the right to share, use and build upon a work that they have created. GPL is primarily designed for providing public licence to a software. GNU GPL is another free software license, which provides end users the freedom to run, study, share and modify the software, besides getting regular updates.

### **Cyber Crime:**

Cybercrime is any criminal offence involving the use of electronic communication, computer or internet. The term "Cybercrime" covers phishing, Identity theft, credit card frauds, illegal downloading, child pornography, cyber bullying, cyber trolls, cyber stalking, and cyber terrorism, distribution of viruses, spam, and industrial intelligence and so on.

**(A) Hacking:** Hacking is the act of unauthorised access to a computer, computer network or any digital system. Hackers usually have technical expertise in hardware and software. They look for bugs to exploit and break into the system.

**Ethical Hacking:** Hacking, when done with a positive intent, is called ethical hacking. Such ethical hackers are known as white hat hackers. They are specialists in exploring any loophole during testing of the software. Thus, they help in improving the security of a software and preparing the owner against any cyber-attack.

**Non-ethical hacker:** A non-ethical hacker is the one who tries to gain unauthorized access to computers or networks in order to steal sensitive data with the intent to damage or bring down systems. They are called black hat hackers or crackers. Their primary focus is on security cracking and data stealing. They use their skill for illegal or malicious purposes. Such hackers try to break through system securities for identity theft, monetary gain, to bring a competitor or rival site down, to leak sensitive information, etc.

### **(B) Online Fraud:**

Fraud committed using the internet is called online fraud and may occur in many ways

Example: Non-delivery goods, non-existent companies, stealing information,

Fraudulent payments etc.

### **(C) Cyber Trolls:**

Posting insulted messages online targeting people is called cyber trolls. It is closely related to cyberbullying.

### **(D) Cyber Bullying:**

Harassing people or acting like someone or posting negative comments to someone or acting like someone using modern technologies such as internet, email, cell phone, instant massagers', social networks etc. is called Cyber Bullying.

**(E) Cyber Stalking:**

Cyber stalking is a crime in which the attacker harasses a specific victim using electronic communication such as email or online message. Stalkers know their victims and they attack online instead resolving issues off line.

**(F) Child pornography:**

Child Pornography is defined as any visual or written representation including images or video that depicts sexual activity of anyone under the age of 18. Child pornography is sometimes called "child sexual abuse images".

**(G) Digital Forensics:**

It refers to methods used for interpretation of computer media for digital evidence.

**(H) Phishing & Fraud Emails:**

Phishing is a cyber-attack that uses email or a website as a weapon to trick the email recipient into believing that the message is something they want or need — a request from their bank, to click a link or download an attachment. They try to gather personal information or debit/credit card information.

The most common phishing method is through email spoofing where a fake or forged email address is used and the user presumes it to be from an authentic source. So, you might get an email from an address that looks similar to your bank or educational institution, asking for your information, but if you look carefully, you will see their URL address is fake. Phishing attempts through phone calls or text messages are also common these days.

**(I) Identity theft:**

Identity theft is the unauthorized use of someone else's personal information to commit fraud, typically for financial gain.

Example: Using names, social security numbers, credit card details, or other identifying data without permission to open accounts, make purchases,

**(J) Ransomware:**

This is another kind of cybercrime where the attacker gains access to the computer and blocks the user from accessing, usually by encrypting the data. The attacker blackmails the victim to pay for getting access to the data, or sometimes threatens to publish personal and sensitive information or photographs unless a ransom is paid.

**Preventing Cyber Crime**

Following points can be considered as safety measures to reduce the risk of cybercrime:

- i) Take regular backup of important data.
- ii) Use an antivirus software and keep it updated always.
- iii) Avoid installing pirated software. Always download software from known and secure (**https**) sites.
- iv) Always update the system software which include the Internet browser and other application software
- v) Do not visit or download anything from untrusted websites.
- vi) Use a strong password for web login, and change it periodically. Do not use the same password for all the websites. Use different combinations of alphanumeric characters including special characters. Ignore common words or names in passwords.
- vii) While using someone else's computer, don't allow browsers to save password or auto fill data, and try to browse in your private browser window.
- viii) For an unknown site, do not agree to use cookies when asked for through a Yes/No option.

- ix) Perform online transactions like shopping, ticketing, and other such services only through well-known and secure sites.
- x) Always secure wireless networks at home with a strong password and regularly change it.

### **Cyber Law and IT Act:**

Cyber law refers to all the legal and regulatory aspects of the internet. In India cyber law was enforced through IT Act, 2000. Its purpose is to provide legal recognition to electronic commerce. Electronic Governance i.e. E-documents get legal recognition. The maximum penalty for any damage to computers is fine up to 1 crore.

### **E-Waste: Hazards and Management**

Electronic waste describes discarded electronic devices. "Electronic waste" may also be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators. This includes used electronics which are destined for reuse, resale, salvage, recycling or disposal.

Electrical and Electronic equipment contains metallic and non-metallic elements such as Copper, Aluminium, Gold, Silver, Palladium Platinum, Nickel, Tin, Lead, Iron, Sulphur, Phosphorous, Arsenic etc.

### **Impact of e-waste on environment:**

To some extent, e-waste is responsible for the degradation of our environment. Whether it is emission of gases and fumes into the atmosphere, discharge of liquid waste into drains or disposal of solid e-waste materials, all of this contributes to environmental pollution in some way or the other.

#### **A) Impact of e-waste on humans:**

The electronic devices are manufactured using certain metals and elements like lead, beryllium, cadmium, plastics, etc. Most of these materials are difficult to recycle and are considered to be toxic and carcinogenic. If e-waste is not disposed of in proper manner, it can be extremely harmful to humans, plants, animals and the environment as discussed below:

- One of the most widely used metals in electronic devices (such as monitors and batteries) is lead.

When lead enters the human body through contaminated food, water, air or soil, it causes lead poisoning which affects the kidneys, brain and central nervous system. Children are particularly vulnerable to lead poisoning.

#### **B) Management of E-waste (3 R)**

Some of the feasible methods of e-waste management are reduce, reuse and recycle.

• **Reduce:** We should try to reduce the generation of e-waste by purchasing the electronic or electrical devices only according to our need. Also, they should be used to their maximum capacity and discarded only after their useful life has ended. Good maintenance of electronics devices also increases the life of the devices.

• **Reuse:** It is the process of re-using the electric waste after slight modification. The electronic equipment that is still functioning should be donated or sold to someone who is still willing to use it. The process of re-selling old electronic goods at lower prices is called refurbishing.

- **Recycle:** Recycling is the process of conversion of electronic devices into something that can be used again, and again in some or the other manner. Only those products should be recycled that cannot be repaired, refurbished or re-used.

### **Awareness about health concerns related to the usage of technology**

**IMPACT ON HEALTH:** Excessive usage of digital devices has a negative impact on our physical as well as psychological well-being. Ergonomic positioning of devices as well as our posture are important. When we continuously look at the screen for watching, typing, chatting or playing games, our eyes are continuously exposed to the glare coming from the screens. Looking at small handheld devices makes it worse. Eye strain is a symptom commonly complained by users of digital devices. Stress, physical fatigue and obesity are the other related impacts the body may face if one spends too much time using digital devices.

### **Device Safety: Ensures Good Health of a Computer System**

- Regularly clean it to keep the dust off. Use a liquid solution specifically formulated for the cleaning of electronic screens.
- Wipe monitor's screen often using the regular microfiber soft cloth (the one used for spectacles).
- Keep it away from direct heat, sunlight and put it in a room with enough ventilation for air circulation.
- Do not eat food or drink over the keyboard. Food crumbs that fall into the gaps between the keys or spilled over liquid can cause issues to the devices

### **Multiple Choice Questions**

| Q. No | Question                                                                                                                                                                                                                                                                                                                                           |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | <b>Which of the following is not a type of a Cybercrime?</b><br>A) Data theft    B) Forgery    C) Damage to data    D) Installing Antivirus for Protection<br><b>Answer: D</b>                                                                                                                                                                     |
| 2.    | <b>What is the name of the IT Law that India is having in the Indian Legislature?</b><br>A. India's Technology (IT) Act 2000<br>B. India's Digital information Technology (DIT) Act ,2000<br>C. The Information Technology Act ,2000<br>D. The Technology Act ,2008<br><b>Answer: C</b>                                                            |
| 3.    | <b>What is an example of e- waste?</b><br>A) A ripened banana    B) An old computer    C) Old clothes    D) Empty soda cans<br><b>Answer: B</b>                                                                                                                                                                                                    |
| 4.    | <b>An organization purchases new computers every year and dumps the old ones into the local dumping yard. Write the name of the most appropriate category of waste that the organization is creating every year, out of the following options:</b><br>A) Solid waste    B) Commercial waste    C) E waste    D) Business waste<br><b>Answer: C</b> |
| 5.    | <b>Which electronic device can be used for cyber bullying?</b><br>A) Television    B) Cell Phones    C) Typewriter    D)CD Player<br><b>Answer: B</b>                                                                                                                                                                                              |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6.  | <b>What is an example of cyberbullying?</b><br>A) Telling someone their shirt is ugly      B) Hitting someone<br>C) Mean text messages      D) Ignoring someone that is talking to you.<br><b>Answer: C</b>                                                                                                                                                                                                                                                                        |
| 7.  | <b>When can cyber bullying not happen?</b><br>A) When you are at school      B) When you talk with your friends<br>C) When you are at home      D) When you talk to someone face to face<br><b>Answer: D</b>                                                                                                                                                                                                                                                                       |
| 8.  | <b>What do you do if you or someone you know is being cyber bullied?</b><br>A) Get into a fight with that person      B) Keep it to yourself<br>C) Let someone know      D) Delete the text messages<br><b>Answer: C</b>                                                                                                                                                                                                                                                           |
| 9.  | <b>_____ is an internet scam done by cyber-criminals where the user is convinced digitally to provide confidential information?</b><br>A) Phishing attack      B) DoS attack      C) Website attack      D) MiTM attack<br><b>Answer: A</b>                                                                                                                                                                                                                                        |
| 10. | <b>Which of the following types of data, phishers cannot steal from its target victims?</b><br>A) Email      B) phone number      C) passwords      D) apps installed in the mobile<br><b>Answer: D</b>                                                                                                                                                                                                                                                                            |
| 11. | <b>Which toxic compound is not found in e-waste?</b><br>A) Mercury      B) Cadmium      C) Neon      D) Lead<br><b>Answer: C</b>                                                                                                                                                                                                                                                                                                                                                   |
| 12. | <b>After using his email id, Parth forgot to sign off from his email account. Later, his servant saw his computer open and started using it. His servant's activity is an example of which of the following cybercrime?</b><br>A) Hacking      B) Identity theft      C) Cyber bullying      D) Plagiarism<br><b>Answer: B</b>                                                                                                                                                     |
| 13. | <b>After a fight with your friend, you did the following activities. Which of these activities is not an example of cyberbullying?</b><br>A. You sent an email to your friend with a message saying that "I am sorry".<br>B. You sent a threatening message to your friend saying "Do not try to call or talk to me."<br>C. You created an embarrassing picture of your friend and uploaded it to your account on a social networking site.<br>D. All of these<br><b>Answer: A</b> |
| 14. | <b>Rita is receiving threatening emails from some unknown sender repeatedly. What should she do?</b><br>A. Inform parents, teacher and go to Police station with parents.<br>B. Ignore them<br>C. Keep silent and not tell anybody about it<br>D. Follow the instructions of the sender<br><b>Answer: A</b>                                                                                                                                                                        |
| 15. | <b>True name and Account Takeover are categories of?</b><br>A) Identity theft      B) Plagiarism      C) Phishing      D) None of these<br><b>Answer: A</b>                                                                                                                                                                                                                                                                                                                        |
| 16. | <b>What is meant by the term 'cyber-crime'?</b><br>A. Any crime that uses computers to jeopardise or attempt to jeopardise national security                                                                                                                                                                                                                                                                                                                                       |

|     |                                                                                                                                                                                                                                                                                                                                                                                           |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | <p>B. The use of computer networks to commit financial or identity theft</p> <p>C. The theft of digital information</p> <p>D. Any crime that involves computers and networks</p> <p><b>Answer: D</b></p>                                                                                                                                                                                  |
| 17. | <p><b>Which of the following is a responsible method for disposing of e-waste?</b></p> <p>A. Burning electronic devices in an open field</p> <p>B. Throwing electronic devices in regular garbage</p> <p>C. Recycling or donating old electronic devices</p> <p>D. Storing unused electronic devices indefinitely</p> <p><b>Answer: C</b></p>                                             |
| 18. | <p><b>Which of the following actions is considered a form of plagiarism?</b></p> <p>A. Quoting someone's work with proper citation</p> <p>B. Paraphrasing text without attribution</p> <p>C. Creating original content based on research</p> <p>D. Citing sources correctly in a bibliography</p> <p><b>Answer: B</b></p>                                                                 |
| 19. | <p><b>Identify the type of cybercrime where attackers impersonate a legitimate entity to deceive individuals into providing sensitive information like usernames, passwords, credit card numbers, or other personal data.</b></p> <p>A) Phishing                      B) Hacking                      C) Identity Theft                      D) Cyberstalking</p> <p><b>Answer: A</b></p> |
| 20. | <p><b>Using someone else's credentials to send inflammatory email messages is an act of</b></p> <p>A) Plagiarism                      B) Hacking                      C) Identity theft                      D) Cyber bullying</p> <p><b>Answer: C</b></p>                                                                                                                                |
| 21. | <p><b>Which of the following is not a cyber-crime?</b></p> <p>A) Phishing                      B) Cyberstalking                      C) Identity theft                      D) Online chatting</p> <p><b>Answer: D</b></p>                                                                                                                                                                |
| 22. | <p><b>What does e-waste stand for</b></p> <p>A) Environmental waste                      B) Electronic waste</p> <p>C) Electrical waste                      D) Equipment waste</p> <p><b>Answer: B</b></p>                                                                                                                                                                               |
| 23. | <p><b>E-waste contains heavy metals such as _____ and _____ which are highly toxic when ingested.</b></p> <p>A) Hydrogen and Mercury                      B) Lead and Argon</p> <p>C) Lead and Mercury                      D) Hydrogen and Argon</p> <p><b>Answer: C</b></p>                                                                                                             |
| 24. | <p><b>Maanya purchased a license for a copy of a software and made additional copies without the permission of the copyright owner. This act of hers is known as_____.</b></p> <p>A) Trademark Infringement                      B) Identity Theft</p> <p>C) Copyright Infringement                      D) Patent</p> <p><b>Answer: C</b></p>                                            |
| 25. | <p><b>Rama was unable to understand how the recruiters were able to know about her digital activity when she had not shared anything with them. The recruiters might have checked.</b></p> <p>A) Carbon Footprint                      B) Water Footprint</p> <p>C) Online print of Rama                      D) Digital Footprint</p> <p><b>Answer: D</b></p>                            |

|     |                                                                                                                                                                |                                                       |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| 26. | _____ help in data protection through copyrights, patents and trademarks:<br>A) Data Privacy Right<br>C) Intellectual Property Rights(IPR)<br><b>Answer: C</b> | B) Right to Innovation<br>D) Right to Data Protection |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|

| <b>Assertion and Reasoning Based Questions</b>                                                                                                                                                                                     |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>A: Assertion, R: Reason</b><br>Mark the correct choice as<br>A) Both A & R are true and R explains A<br>B) Both A & R are true but R does not explain A<br>C) A is true but R is false<br>D) A is false but R is true           |  |
| Q1 <b>Assertion:</b> The trail of online activity is called Digital Footprint.<br><b>Reason:</b> Digital footprints are the records of online activities of an individual.<br><b>Answer: A</b>                                     |  |
| Q2 <b>Assertion:</b> Copyright, Patents and Trademarks are Intellectual Property Rights.<br><b>Reason:</b> Intellectual Property Rights allow creators to decide how their creations are used.<br><b>Answer: A</b>                 |  |
| Q3 <b>Assertion:</b> social media cannot create or share content—they only allow networking.<br><b>Reason:</b> We shouldn't respond to unnecessary emails or comments.<br><b>Answer: D</b>                                         |  |
| Q4 <b>Assertion:</b> Hacking is compromising security on digital devices.<br><b>Reason:</b> Hacking involves stealing passwords and other digital information.<br><b>Answer: A</b>                                                 |  |
| Q5 <b>Assertion:</b> Phishing is a method used to trick people into revealing personal information online.<br><b>Reason:</b> Phishing websites look like legitimate websites to deceive users.<br><b>Answer: A</b>                 |  |
| Q6 <b>Assertion:</b> Writing messages in all capital letters is considered rude in online communication.<br><b>Reason:</b> All capital letters represent strong emotions or shouting in digital conversations.<br><b>Answer: A</b> |  |
| Q7 <b>Assertion:</b> Improper disposal of e-waste can lead to environmental pollution.<br><b>Reason:</b> E-waste contains hazardous materials like lead, mercury, and cadmium.<br><b>Answer: A</b>                                 |  |
| Q8 <b>Assertion:</b> The digital divide is the gap between people with access to digital technologies and those without.<br><b>Reason:</b> High-speed internet is equally available in rural and urban areas.<br><b>Answer: C</b>  |  |
| Q9 <b>Assertion:</b> Creative Commons licenses allow creators to give others permission to use their work.<br><b>Reason:</b> Under Creative Commons, all works automatically become public domain.<br><b>Answer: C</b>             |  |
| Q10 <b>Assertion:</b> Downloading copyrighted software without a license is illegal.<br><b>Reason:</b> It violates the software's intellectual property rights.<br><b>Answer: A</b>                                                |  |

## Short Answer Questions

**Q.1) Amit got good marks in all the subjects. His father gifted him a smartphone. He would like to make Amit aware of health hazards associated with inappropriate and excessive use of smartphones. Help his father to list the points which he should discuss with Amit.**

**Answer:** Eye Strain, Poor Posture, Sleep Disruption, Mental Health Issues, Addiction and Dependency, Reduced Physical Activity, Social Isolation

**Q.2) What are the digital footprint, and why are they important in the digital world?**

**Answer:** A digital footprint refers to the trail of data and online activities left behind by individuals, organizations or devices on the internet and digital platforms. It encompasses various digital traces. Digital footprints are important because:

- i) Personal Branding: online presence affects reputation and career opportunities.
- ii) Privacy and security: Digital footprints can compromise sensitive information
- iii) Targeted Advertising: online activities influence personalized ads.

**Q.3) A school plans to upload students' photographs and personal details on its website. Suggest any two precautions the school should take to ensure privacy and cyber safety.**

**Answer:**

- i) Take permission from parents/students before uploading data.
- ii) Avoid sharing sensitive personal information like addresses or phone numbers.

**Q.4) A hospital stores patient records digitally. Doctors can access reports online, but hackers attempted to steal patient information. Answer the following:**

- a) Name the ethical concern involved.
- b) Suggest two security measures to protect the data.

**Answer:**

- a) Data Privacy / Data Security
- b) i) Use encryption
- ii) Apply strong passwords and authentication

## Long Answer Questions

**Q.1) Rahul wants to throw away his old mobile phone, but he's not sure how to do it properly.**

**I. What are the environmental risks of disposing of mobile phones improperly?**

**II. What is one eco-friendly way Rahul can dispose of his old phone?**

**III. How does proper disposal of mobile phones benefit the environment?**

**Answer:**

I. Improper disposal of mobile phones can lead to the release of harmful chemicals, such as lithium and arsenic, which can leach into the soil and water, causing pollution and damaging ecosystems.

II. Rahul can take his old mobile phone to a certified recycling program or donate it to an organization that refurbishes old phones for reuse.

III. Proper disposal of mobile phones prevents harmful chemicals from contaminating the environment, saves energy by recovering valuable materials like gold and silver, and reduces the need for mining new raw materials, helping to protect natural resources.

**Q.2) Police officials arrested four members of an interstate gang for allegedly duping many people from different states on the pretext of providing them with holiday packages after creating fake websites of Tours and Travels. The cyber criminals sent fraudulent emails containing links to fraudulent websites created by them. 3 The victim in his complaint told police that he was offered a holiday package to Dubai a total of 10 times in the next 10 years and was charged ` 1.45 lakh through his credit card. Answer the following questions pertaining to the given news byte:**

**(i) Identify the type of cybercrime mentioned in the above case.**

**(ii) Which Act deals with such crimes in India?**

**(iii) Suggest any one precaution that can be taken to avoid falling prey to such criminals.**

**Answer: (a)**

**(i) Phishing**

**(ii) IT Act 2000**

**(iii) To avoid phishing attacks, consider implementing the following precautions:**

- Do not click on links or download attachments in unsolicited emails, messages, or pop-up windows.
- Avoid sharing sensitive information, such as passwords, account numbers, or Social Security numbers, in response to unsolicited requests.
- Check the URL of websites you visit to ensure they are legitimate.
- Ensure that your operating system, antivirus software, and web browsers are up to date with the latest security patches. [Write any one]

**Q.3) A school computer lab uses many electronic devices daily, leading to high electricity consumption and generation of electronic waste. The school administration wants to adopt environmentally friendly practices to reduce its impact on the environment. Identify the concept being highlighted above and suggest any four practices that can help achieve it.**

**Answer: Green Computing means environmentally responsible use of computers and electronic devices.**

**Practices:**

- Recycling e-waste
- Using energy-efficient devices
- Switching off unused systems
- Reducing paper usage

**CBSE QUESTION PAPER**  
**CLASS 12 – SESSION (2025-26)**  
**SUBJECT: INFORMATICS PRACTICES (065)**

Class - XII  
M.M.- 70  
Hrs

Set: 4  
Time - 03:00

**General Instructions:**

1. Please check this question paper contains 37 questions.
2. All questions are compulsory. However, internal choices have been provided in few questions.

Attempt only one of the choices in such questions.

3. The paper is divided into 5 Sections- A, B, C, D and E.
4. Section A consists of 21 questions (1 to 21). Each question carries 1 Mark.
5. Section B consists of 7 questions (22 to 28). Each question carries 2 Marks.
6. Section C consists of 4 questions (29 to 32). Each question carries 3 Marks.
7. Section D consists of 2 questions (33 to 34). Each question carries 4 Marks.
8. Section E consists of 3 questions (35 to 37). Each question carries 5 Marks.
9. All programming questions are to be answered using Python Language only.
10. In case of MCQ, text of the correct answer should also be written.

|    | <b>SECTION – A (21 × 1 = 21 Marks)</b>                                                                                                                                                                                                                                                                                                                   |     |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1. | State whether the following statement is True or False:<br>In Pandas Series, the Positional index can be a string or an integer.                                                                                                                                                                                                                         | (1) |
| 2. | We can add a new row to a DataFrame DF using the _____ method.<br>(A) DF.add() (B) DF.loc[] (C) DF.loc() (D) DF.addloc[]                                                                                                                                                                                                                                 | (1) |
| 3. | Naveen discarded various types of waste material without realizing that e-waste contains harmful substances that could pollute the environment. He wants to know which of the following will be considered as e-waste?<br>(A) Plastic Bottle (B) Broken Smartphone (C) Aluminium Foil (D) Banana Peel                                                    | (1) |
| 4. | In which scenario is a bar chart preferred over a line chart?<br>(A) To visualise monthly temperature trends over a year.<br>(B) To compare the number of students in different classes.<br>(C) To show stock price movements over time.<br>(D) To analyse trends in website traffic over days.                                                          | (1) |
| 5. | Which of the following network topology uses a central cable (backbone) to connect all devices?<br>(A) Mesh (B) Star (C) Tree (D) Bus                                                                                                                                                                                                                    | (1) |
| 6. | State whether the following statement is True or False:<br>In SQL, an aggregate function returns multiple values for each column on which it is applied.                                                                                                                                                                                                 | (1) |
| 7. | Rohini has developed a new kind of water purifier that uses a unique filtration method. Which type of Intellectual Property Right should she apply to protect her invention?<br>(A) Trademark (B) Copyright (C) Patent (D) Both Copyright & Trademark                                                                                                    | (1) |
| 8. | Aditya is working on a DataFrame named df. He has written the statement:<br>print(df.loc['S2'])<br>What will the above statement do?<br>(A) Display the data of the row having label 'S2'.<br>(B) Display the columns of the DataFrame.<br>(C) Display the data type of the column having label 'S2'.<br>(D) Display the index numbers of the DataFrame. | (1) |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 9.  | What will be the result of the following SQL command?<br>SELECT LENGTH ('Data Base');<br>(Note: There is single space between the words Data and Base.)<br>(A) 7      (B) 8      (C) 9      (D) Error                                                                                                                                                                                                                                                | (1) |
| 10. | Which of the following is a key feature of a Static Web Page?<br>(A) Its content updates very frequently.<br>(B) It displays different content to different users.<br>(C) It loads slower than a Dynamic Web Page.<br>(D) It shows the same content unless the code is manually updated.                                                                                                                                                             | (1) |
| 11. | Which of the following is the correct expanded form of DML?<br>(A) Device Management Language<br>(B) Device Manipulation Language<br>(C) Data Management Language<br>(D) Data Manipulation Language                                                                                                                                                                                                                                                  | (1) |
| 12. | CSV stands for Separated Values.<br>(A) Colon      (B) CTRL      (C) Comma      (D) Caret                                                                                                                                                                                                                                                                                                                                                            | (1) |
| 13. | Which of the following is an example of maintaining good net etiquette?<br>(A) Spamming emails or messages to strangers.<br>(B) Ignoring other's opinions in online discussions.<br>(C) Not using copyrighted materials without permission of the owner.<br>(D) Sharing someone's private information publicly.                                                                                                                                      | (1) |
| 14. | In the context of creating a Pandas Series from a dictionary, which of the following statement is correct?<br>(A) The values of the dictionary become the indices of the Series.<br>(B) The keys of the dictionary become the values of the Series.<br>(C) The keys of the dictionary become the indices of the Series.<br>(D) The Series will have default integer indices starting from 0, ignoring the dictionary keys.                           | (1) |
| 15. | In Pandas, when extracting a portion of a Series serl using serl[start:end] with positional indices start and end, which of the following statements is true?<br>(A) The element at the end index is included in the output.<br>(B) The element at the end index is excluded from the output.<br>(C) The elements at both the start and end indices are excluded from the output.<br>(D) The element at the start index is excluded from the output. | (1) |
| 16. | Nisha is using an Android app to make a voice call over the internet to her friend in another country. Which protocol is being used in this case?<br>(A) Chat      (B) VoIP      (C) Email      (D) TV                                                                                                                                                                                                                                               | (1) |
| 17. | State whether the following statement is True or False:<br>The INSTR(string, string2) function in SQL returns 0 if string2 is not present as a substring in string1.                                                                                                                                                                                                                                                                                 | (1) |
| 18. | In a Pandas DataFrame, which value for axis will be used to delete a column?<br>(A) axis = -1      (B) axis = 0      (C) axis = 1      (D) axis = 2                                                                                                                                                                                                                                                                                                  | (1) |
| 19. | What will be the result of the following SQL command?<br>SELECT ROUND (15.678, 2);<br>(A) 15.00      (B) 15.67      (C) 15.68      (D) 16.00                                                                                                                                                                                                                                                                                                         | (1) |
|     | <b>Q. 20 and Q. 21 are Assertion (A) and Reason (R) Type questions. Choose the correct option as:</b><br>(A) Both (A) and (R) are True, and (R) correctly explains (A).<br>(B). Both (A) and (R) are True, but (R) does not correctly explain (A).<br>(C) (A) is True, but (R) is False.<br>(D) (A) is False, but (R) is True.                                                                                                                       |     |
| 20. | <b>Assertion (A):</b> Pandas DataFrame can store values of multiple data types in multiple Columns.                                                                                                                                                                                                                                                                                                                                                  | (1) |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
|                                       | <b>Reason (R):</b> DataFrames are implemented using 2D arrays, which allows only numeric values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |
| 21.                                   | <b>Assertion (A):</b> The output of the SQL query SELECT COUNT (name) FROM students; will differ from the output of SELECT COUNT(*) FROM students; if there are some NULL values in the name column.<br><b>Reason (R):</b> COUNT (column_name) returns the count of NON-NULL values in that column, whereas COUNT(*) returns the number of records in the table.                                                                                                                                                                                                    | (1) |
| <b>SECTION – B (7 × 2 = 14 Marks)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |
| 22.                                   | (a) List any two characteristics of Pandas library in Python.<br><b>OR</b><br>(b) Briefly explain the purpose of Boolean Indexing with respect to DataFrames. Support your answer with a suitable example.                                                                                                                                                                                                                                                                                                                                                          | (2) |
| 23.                                   | Anjana had created a website using free design elements sourced from different creators online. She then published the site for public access but did not mention the source of the design elements used.<br>(i) Identify one possible violation of IPR in this situation,<br>(ii) Name any two licensing models that allow legal reuse of digital creative work with conditions.                                                                                                                                                                                   | (2) |
| 24.                                   | Define the following terms with respect to RDBMS:<br>a. Domain                      b. Tuple                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (2) |
| 25.                                   | a) Explain the role of the following network devices in a network:<br>(1) Modem                      (II) Gateway<br><b>OR</b><br>(b) Differentiate between add-ons and plug-ins in a web browser.                                                                                                                                                                                                                                                                                                                                                                  | (2) |
| 26.                                   | Write SQL queries to perform the following:<br>(1) Display the month (in numeric form) of the date '2026-01-01'.<br>(II) Display only the year part from the date '2026-01-01'.                                                                                                                                                                                                                                                                                                                                                                                     | (2) |
| 27.                                   | (a) What is data protection?<br>(b) Mention any two precautionary measures one can take to avoid the risk of cybercrime.                                                                                                                                                                                                                                                                                                                                                                                                                                            | (2) |
| 28.                                   | (a) Niharika wants to create a Pandas Series using a NumPy array with three elements 'a', 'b', and 'c', and assign custom indexes 'first', 'second' and 'third'. Help her complete the code below.<br><pre>import pandas as pd import _____ as np arr np. _____(['a','b','c']) s pd. _____(arr, _____=['first', 'second', 'third']) print(s)</pre> <b>OR</b><br>(b) Write the output of the following code:<br><pre>import pandas as pd s1 = pd. Series ([1, 2, 3], index = ['a','b','c']) s2= pd. Series ([4, 5, 6], index = ['b', 'c', 'd']) print(s1 + S2)</pre> | (2) |
| <b>SECTION - C</b>                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |
| 29.                                   | Mandeep received an email stating he won a lottery though he had never participated in any such event. He was asked to provide bank details to process the amount. Mandeep provided the required details but within next few minutes One lakh was debited from his account.<br>Answer the following questions based on the given case study:<br>(i) Mandeep is the victim of which type of cybercrime?<br>(ii) Other than email, mention any two common methods through which this type of cybercrime is being committed these days.                                | (3) |

|             | (iii) Name one law that safeguards the rights of Internet users in India.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|------------|------|---------|-------------|-------|--------------------|---|---------|-----------------|--------|-------|----------------|---|-------|---|-------|---|--------|---|------|---|-------|-----|---------|-----|-----|---------|---|-----|-----------|---|-----|-------------|---|-----|-----------------------|---|-----|------------------|---|-----|
| 30.         | <p>(a) Write a Python program to create and display a Pandas Series as shown below:<br/>July 31<br/>Aug 31<br/>Sept 30<br/>Oct 31<br/>The index labels are the names of the months July, Aug, Sept, Oct.<br/>The corresponding scalar values are the number of days in these respective months 31, 31, 30, 31.</p> <p style="text-align: center;"><b>OR</b></p> <p>(b) A CSV file named customer.csv contains records of customers. The first row of the file represents the header. Sample data from the file is shown below:<br/>Name, Age, City<br/>Rudra, 17, Kolkata<br/>Divya, 19, Dehradun<br/>Nabeel, 22, Lucknow<br/>Write a Python program to import data from the CSV file into a Pandas DataFrame named DF and display the last two rows.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                   | (3)         |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 31.         | <p>(i) Write an SQL statement to create a table named PRODUCTS with the following specifications:</p> <table><tr><th>Column Name</th><th>Data Type</th><th>Key</th></tr><tr><td>PID</td><td>Integer</td><td>Primary Key</td></tr><tr><td>PName</td><td>Varchar of size 30</td><td></td></tr><tr><td>PCat</td><td>Char of size 15</td><td></td></tr><tr><td>Price</td><td>Decimal Number</td><td></td></tr></table> <p>(ii) Write an SQL query to increase the price of all items by 100, whose product category is <b>Grocery</b>, in the table <b>PRODUCTS</b>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Column Name | Data Type | Key        | PID  | Integer | Primary Key | PName | Varchar of size 30 |   | PCat    | Char of size 15 |        | Price | Decimal Number |   | (3)   |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| Column Name | Data Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Key         |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| PID         | Integer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Primary Key |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| PName       | Varchar of size 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| PCat        | Char of size 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| Price       | Decimal Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 32.         | <p>(a) Consider the following tables:</p> <p><b>Table 1: TEACHER, which stores Teacher ID (TID), Teacher Name (TName), Experience (Experience) and City (City) that they live in.</b></p> <table><tr><th>TID</th><th>TName</th><th>Experience</th><th>City</th></tr><tr><td>1</td><td>Kartik</td><td>5</td><td>Bhopal</td></tr><tr><td>2</td><td>Shahnaz</td><td>6</td><td>Nagpur</td></tr><tr><td>3</td><td>Rajendra</td><td>7</td><td>Delhi</td></tr><tr><td>4</td><td>Tanvi</td><td>4</td><td>Bhopal</td></tr><tr><td>5</td><td>Alam</td><td>9</td><td>Delhi</td></tr></table> <p><b>Table 2: SUBJECT, which stores Subject ID (SID), Subject Name (SubName) and ID of the teacher (TID) teaching that Subject.</b></p> <table><tr><th>SID</th><th>SubName</th><th>TID</th></tr><tr><td>101</td><td>Physics</td><td>1</td></tr><tr><td>102</td><td>Chemistry</td><td>2</td></tr><tr><td>103</td><td>Mathematics</td><td>3</td></tr><tr><td>104</td><td>Informatics Practices</td><td>4</td></tr><tr><td>105</td><td>Computer Science</td><td>5</td></tr></table> <p>Write appropriate SQL query for the following:<br/>(I) Delete the record of the subject whose TID is equal to 4.</p> | TID         | TName     | Experience | City | 1       | Kartik      | 5     | Bhopal             | 2 | Shahnaz | 6               | Nagpur | 3     | Rajendra       | 7 | Delhi | 4 | Tanvi | 4 | Bhopal | 5 | Alam | 9 | Delhi | SID | SubName | TID | 101 | Physics | 1 | 102 | Chemistry | 2 | 103 | Mathematics | 3 | 104 | Informatics Practices | 4 | 105 | Computer Science | 5 | (3) |
| TID         | TName                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Experience  | City      |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 1           | Kartik                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 5           | Bhopal    |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 2           | Shahnaz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6           | Nagpur    |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 3           | Rajendra                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 7           | Delhi     |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 4           | Tanvi                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4           | Bhopal    |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 5           | Alam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 9           | Delhi     |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| SID         | SubName                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | TID         |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 101         | Physics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1           |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 102         | Chemistry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 2           |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 103         | Mathematics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3           |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 104         | Informatics Practices                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4           |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |
| 105         | Computer Science                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5           |           |            |      |         |             |       |                    |   |         |                 |        |       |                |   |       |   |       |   |        |   |      |   |       |     |         |     |     |         |   |     |           |   |     |             |   |     |                       |   |     |                  |   |     |

(II) Display the names of teachers who have more than 5 years of experience and who stay in Nagpur.

(III) Display subject names along with their teacher names.

**OR**

**(b)** Consider the table **LIBRARY** as given below.

| BookId | Title              | Genre       | Price |
|--------|--------------------|-------------|-------|
| 101    | Python Basics      | Technology  | 278   |
| 201    | The Silent Patient | Fiction     | 340   |
| 301    | Data Science       | Technology  | 291   |
| 401    | Oceans             | Marine Life | NULL  |

(I) Which attribute(s) can be considered as the Candidate keys(s)? Justify your answer.

(II) Write an SQL query to insert a new record with the following values:

**BookId: 501, Title: AI for ALL, Genre: Technology, Price: 589**

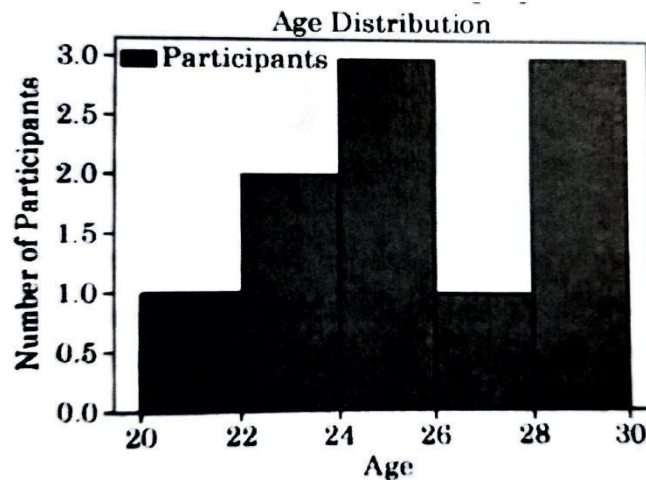
(III) Write an SQL query to add a new column "**Author**" that is a character data type of size 20.

**SECTION – D ( $2 \times 4 = 8$  Marks)**

33. Ms. Anjali, a data analyst, has been assigned the task of creating a histogram to display the age distribution of ten participants in a workshop. She has been provided with the following list of their ages:

**Ages [22, 25, 24, 28, 30, 24, 29, 27, 21, 23]**

She has started writing a Python program for it. However, the code is incomplete. Help her complete the program by filling in the missing parts, so that the histogram as shown below is displayed.



```
import matplotlib.pyplot as plt
Ages [22, 25, 24, 28, 30, 24, 29, 27, 21, 23)
binsize=[20,22,24,26,28,30]
plt.____(Ages, bins=binsize, edgecolor = 'black', label = 'Participants') # Statement1
_____.xlabel('Age') #Statement2
plt.ylabel('Number of Participants')
plt.title("Age Distribution")
```

```
pt._____ # Statement3
```

```
_____ #Statement4
```

I. Write the suitable code for the blank space in the line marked as Statement1 which plots the histogram.

|         | <p>II. Fill in the blank in Statement2 to use the correct alias of the required module to set the label on x axis.</p> <p>III. Fill in the blank in Statement3 with the correct Python code to display the legend on the graph.</p> <p>IV. Fill in the blank in Statetment4 with the appropriate Python code to display the graph.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |             |             |            |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------|-------------|---------|------|--------|-----|------------|------|------|--------|-----|------------|------|------|--------|-----|------------|------|------|---------|-----|------------|------|---------|-------|-------------|----------|-----------|-----|--------|------|----|------------|-----|------|------|----|------|-----|--------|------|---|------------|-----|---------|------|------|------------|-----|
| 34.     | <p>(a) Shalini, who works as a database designer in the hotel industry, has created a table named Guest to keep track of guest details as shown below:</p> <p style="text-align: center;"><b>Table: Guest</b></p> <table><tr><th>GuestID</th><th>GuestName</th><th>RoomNumber</th><th>CheckInDate</th><th>Charges</th></tr><tr><td>G101</td><td>Harish</td><td>101</td><td>2025-04-03</td><td>3000</td></tr><tr><td>G102</td><td>Sunita</td><td>101</td><td>2025-04-03</td><td>3000</td></tr><tr><td>G103</td><td>Ramesh</td><td>102</td><td>2025-05-04</td><td>5000</td></tr><tr><td>G104</td><td>Bhumika</td><td>103</td><td>2025-06-02</td><td>3500</td></tr></table> <p>Write a suitable SQL query for the following:</p> <p>I. Display last 3 characters of guest name in upper case.</p> <p>II. Display the name of the guest along with the day name of check-in date.</p> <p>III. Display the remainder when charges are divided by 1000.</p> <p>IV. Extract and display three characters, starting from the second character, of each guest name.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>(B)</b> Consider the following table</p> <p style="text-align: center;"><b>Table: Orders</b></p> <table><tr><th>ORDERID</th><th>CNAME</th><th>TOTALAMOUNT</th><th>DISCOUNT</th><th>ORDERDATE</th></tr><tr><td>101</td><td>Hemant</td><td>5000</td><td>10</td><td>2024-03-01</td></tr><tr><td>102</td><td>Neha</td><td>7000</td><td>15</td><td>NULL</td></tr><tr><td>103</td><td>Keshav</td><td>3000</td><td>5</td><td>2024-01-20</td></tr><tr><td>104</td><td>Sandhya</td><td>4500</td><td>NULL</td><td>2023-12-25</td></tr></table> <p>Write the output of the following SQL Queries:</p> <p>I. SELECT CNAME FROM ORDERS WHERE DISCOUNT IS NOT NULL;</p> <p>II. SELECT CNAME, DISCOUNT FROM ORDERS WHERE DISCOUNT BETWEEN 5 AND 10;</p> <p>III. SELECT MONTHNAME (ORDERDATE) FROM ORDERS WHERE ORDERDATE IS NOT NULL;</p> <p>IV. SELECT ORDERID, DAY (ORDERDATE) FROM ORDERS;</p> | GuestID     | GuestName   | RoomNumber | CheckInDate | Charges | G101 | Harish | 101 | 2025-04-03 | 3000 | G102 | Sunita | 101 | 2025-04-03 | 3000 | G103 | Ramesh | 102 | 2025-05-04 | 5000 | G104 | Bhumika | 103 | 2025-06-02 | 3500 | ORDERID | CNAME | TOTALAMOUNT | DISCOUNT | ORDERDATE | 101 | Hemant | 5000 | 10 | 2024-03-01 | 102 | Neha | 7000 | 15 | NULL | 103 | Keshav | 3000 | 5 | 2024-01-20 | 104 | Sandhya | 4500 | NULL | 2023-12-25 | (4) |
| GuestID | GuestName                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | RoomNumber  | CheckInDate | Charges    |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| G101    | Harish                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 101         | 2025-04-03  | 3000       |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| G102    | Sunita                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 101         | 2025-04-03  | 3000       |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| G103    | Ramesh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 102         | 2025-05-04  | 5000       |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| G104    | Bhumika                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 103         | 2025-06-02  | 3500       |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| ORDERID | CNAME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | TOTALAMOUNT | DISCOUNT    | ORDERDATE  |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| 101     | Hemant                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5000        | 10          | 2024-03-01 |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| 102     | Neha                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 7000        | 15          | NULL       |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| 103     | Keshav                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3000        | 5           | 2024-01-20 |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| 104     | Sandhya                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 4500        | NULL        | 2023-12-25 |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
|         | <b>SECTION – E (3 × 5 = 15 Marks)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |             |            |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |
| 35      | <p>My Solutions Pvt. Ltd. is a reputed software development and IT consulting firm. The company's head office is located in Mysuru, and it has a regional office in Chennai. The Mysuru office comprises four departments: Human Resources, Research, Design and Technical Support.</p> <div><div><p style="text-align: center;"><b>Mysuru Head Office</b></p><div><div>Human Resources</div><div>Research</div><div>Design</div><div>Technical Support</div></div></div><div><p style="text-align: center;">Chennai<br/>Regional<br/>Office</p></div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |             |            |             |         |      |        |     |            |      |      |        |     |            |      |      |        |     |            |      |      |         |     |            |      |         |       |             |          |           |     |        |      |    |            |     |      |      |    |      |     |        |      |   |            |     |         |      |      |            |     |

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------|---------------------------|--------|--------------------------------------|--------|--------------------|-------|-------------------------------|-------|-----------------------------|-------|---------------------------------|--------|-----|-------|---|-------|-----|-------|---|-------|----|-------|-----|
|                                      | <p>The distances between these departments and between Mysuru and Chennai are as follows:</p> <table><tr><td>Human Resources to Research</td><td>55 m</td></tr><tr><td>Human Resources to Design</td><td>75 m</td></tr><tr><td>Human Resources to Technical Support</td><td>140 m</td></tr><tr><td>Research to Design</td><td>40 m</td></tr><tr><td>Research to Technical Support</td><td>80 m</td></tr><tr><td>Design to Technical Support</td><td>60 m</td></tr><tr><td>Mysuru Office to Chennai Office</td><td>350 km</td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Human Resources to Research | 55 m   | Human Resources to Design | 75 m   | Human Resources to Technical Support | 140 m  | Research to Design | 40 m  | Research to Technical Support | 80 m  | Design to Technical Support | 60 m  | Mysuru Office to Chennai Office | 350 km |     |       |   |       |     |       |   |       |    |       |     |
| Human Resources to Research          | 55 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Human Resources to Design            | 75 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Human Resources to Technical Support | 140 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Research to Design                   | 40 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Research to Technical Support        | 80 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Design to Technical Support          | 60 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Mysuru Office to Chennai Office      | 350 km                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
|                                      | <p>The number of computers in each department/ office is as follows:</p> <table><tr><td>Human Resources</td><td>30</td></tr><tr><td>Research</td><td>80</td></tr><tr><td>Design</td><td>50</td></tr><tr><td>Technical Support</td><td>20</td></tr><tr><td>Chennai Office</td><td>35</td></tr></table> <p>As a network engineer, you have to propose solutions for queries listed from I to V.</p> <p>1. Identify the most suitable department to install the main server in the Mysuru office. Justify your answer with a valid reason.</p> <p>II. Create a cable layout design to establish Wired network connectivity between the departments in the Mysuru Office.</p> <p>III. Suggest the appropriate network device to connect multiple computers within the Research department.</p> <p>IV. What type of network (LAN, MAN, WAN) would best connect the Mysuru and Chennai office?</p> <p>V. Which device should be used if the signal strength weakens while transmitting data between the Human Resources and Technical Support departments due to the long distance between them?</p> | Human Resources             | 30     | Research                  | 80     | Design                               | 50     | Technical Support  | 20    | Chennai Office                | 35    | (5)                         |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Human Resources                      | 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Research                             | 80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Design                               | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Technical Support                    | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| Chennai Office                       | 35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| 36.                                  | <p>Consider the DataFrame Scholarship shown below:</p> <table><tr><td></td><td>Name</td><td>Course</td><td>Amount</td></tr><tr><td>0</td><td>Ananya</td><td>B.Sc.</td><td>62000</td></tr><tr><td>1</td><td>Karan</td><td>B.Tech</td><td>67000</td></tr><tr><td>2</td><td>Simran</td><td>MCA</td><td>64000</td></tr><tr><td>3</td><td>Rahul</td><td>BCA</td><td>70000</td></tr><tr><td>4</td><td>Priya</td><td>BA</td><td>69000</td></tr></table> <p>Answer the following questions:</p> <p>I. Write Python code to create and display the given DataFrame using the Dictionary of Series method.</p> <p>II. Rename row indexes to ['a', 'b', 'c', 'd', 'e']</p> <p>III. Write Python statement to remove the last row of the given DataFrame</p>                                                                                                                                                                                                                                                                                                                                               |                             | Name   | Course                    | Amount | 0                                    | Ananya | B.Sc.              | 62000 | 1                             | Karan | B.Tech                      | 67000 | 2                               | Simran | MCA | 64000 | 3 | Rahul | BCA | 70000 | 4 | Priya | BA | 69000 | (5) |
|                                      | Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Course                      | Amount |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| 0                                    | Ananya                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | B.Sc.                       | 62000  |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| 1                                    | Karan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | B.Tech                      | 67000  |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| 2                                    | Simran                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | MCA                         | 64000  |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| 3                                    | Rahul                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BCA                         | 70000  |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| 4                                    | Priya                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | BA                          | 69000  |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |
| 37.                                  | <p>(a) Write suitable SQL query for the following:</p> <p>I. To display only the date part from the date/time expression '2026-01-01 10:10:10'</p> <p>II. To convert all customer names from the CustName column to lowercase in the Customer table.</p> <p>III. To extract the first 4 characters from the City Name column in Location table.</p> <p>IV. To display the name of the city from the CITY column in EVENT table, after removing leading spaces.</p> <p>V. To find the average salary from Salary column in Employees table.</p> <p style="text-align: center;"><b>OR</b></p> <p>(b) Write suitable SQL query for the following:</p> <p>I. To display the value of <math>17^2</math>.</p> <p>II. To display the day part of the dates in the HireDate column of the Employee table.</p> <p>III. To display the maximum value of the Bill Amount column in the Bill table.</p>                                                                                                                                                                                                    | (5)                         |        |                           |        |                                      |        |                    |       |                               |       |                             |       |                                 |        |     |       |   |       |     |       |   |       |    |       |     |

|  |                                                                                                                                                             |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | IV. To remove leading & trailing spaces from the Location column in the Branch table.<br>V. To display total salary from tot_sal column in Employees table. |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**CBSE MARKING SCHEME**  
**CLASS 12 – SESSION (2025-26)**  
**SUBJECT: INFORMATICS PRACTICES (065)**

| SECTION – A (21 × 1 = 21 Marks) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |          |                            |                                 |                      |                             |       |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|----------------------------|---------------------------------|----------------------|-----------------------------|-------|
| 1.                              | False                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (1)     |          |                            |                                 |                      |                             |       |
| 2.                              | (B) DF.loc[]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (1)     |          |                            |                                 |                      |                             |       |
| 3.                              | (B) Broken Smartphone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (1)     |          |                            |                                 |                      |                             |       |
| 4.                              | (B) To compare the number of students in different classes                                                                                                                                                                                                                                                                                                                                                                                                                                           | (1)     |          |                            |                                 |                      |                             |       |
| 5.                              | (D) Bus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (1)     |          |                            |                                 |                      |                             |       |
| 6.                              | False                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (1)     |          |                            |                                 |                      |                             |       |
| 7.                              | (C) Patent                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | (1)     |          |                            |                                 |                      |                             |       |
| 8.                              | (A) Display the data of the row having label 'S2'                                                                                                                                                                                                                                                                                                                                                                                                                                                    | (1)     |          |                            |                                 |                      |                             |       |
| 9.                              | (C) 9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (1)     |          |                            |                                 |                      |                             |       |
| 10.                             | (D) It shows the same content unless the code is manually updated                                                                                                                                                                                                                                                                                                                                                                                                                                    | (1)     |          |                            |                                 |                      |                             |       |
| 11.                             | (D) Data Manipulation Language                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (1)     |          |                            |                                 |                      |                             |       |
| 12.                             | (C) Comma                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (1)     |          |                            |                                 |                      |                             |       |
| 13.                             | (C) Not using copyrighted materials without permission of the owner                                                                                                                                                                                                                                                                                                                                                                                                                                  | (1)     |          |                            |                                 |                      |                             |       |
| 14.                             | (C) The keys of the dictionary become the indices of the Series                                                                                                                                                                                                                                                                                                                                                                                                                                      | (1)     |          |                            |                                 |                      |                             |       |
| 15.                             | (B) The element at the end index is excluded from the output                                                                                                                                                                                                                                                                                                                                                                                                                                         | (1)     |          |                            |                                 |                      |                             |       |
| 16.                             | (B) VoIP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (1)     |          |                            |                                 |                      |                             |       |
| 17.                             | True                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | (1)     |          |                            |                                 |                      |                             |       |
| 18.                             | (C) axis = 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (1)     |          |                            |                                 |                      |                             |       |
| 19.                             | (C) 15.68                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (1)     |          |                            |                                 |                      |                             |       |
| 20.                             | (C) Assertion is True, Reason is False                                                                                                                                                                                                                                                                                                                                                                                                                                                               | (1)     |          |                            |                                 |                      |                             |       |
| 21.                             | (A) Both Assertion and Reason are True, and Reason correctly explains Assertion                                                                                                                                                                                                                                                                                                                                                                                                                      | (1)     |          |                            |                                 |                      |                             |       |
| SECTION – B (7 × 2 = 14 Marks)  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |          |                            |                                 |                      |                             |       |
| 22.                             | <p><b>(a) Any two characteristics of Pandas:</b><br/>It provides fast and efficient DataFrame objects.<br/>It supports handling of missing data.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>(b) Boolean Indexing: Boolean Indexing is used to filter data in a DataFrame using conditions.</b><br/>import pandas as pd<br/>df = pd.DataFrame({'Marks':[80,45,67]})<br/>print(df[df['Marks'] &gt; 50])</p>                                                                                | (1*2)   |          |                            |                                 |                      |                             |       |
| 23.                             | <p>(i) Possible violation: Copyright infringement<br/>(ii) Two licensing models:<br/>1. Creative Commons License                      2. Open Source License</p>                                                                                                                                                                                                                                                                                                                                     | (1*2)   |          |                            |                                 |                      |                             |       |
| 24.                             | <p><b>(a) Domain:</b> A domain is the set of valid values allowed in a column.<br/><b>(b) Tuple:</b> A tuple is a single row/record in a table.</p>                                                                                                                                                                                                                                                                                                                                                  | (1*2)   |          |                            |                                 |                      |                             |       |
| 25.                             | <p><b>(a)</b> (i) Modem: It converts digital signals into analog signals and vice versa.<br/>(ii) Gateway: A gateway connects networks using different protocols.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>(b) Difference between Add-ons and Plug-ins</b></p> <table><tr><th>Add-ons</th><th>Plug-ins</th></tr><tr><td>Add extra browser features</td><td>Run specific multimedia/content</td></tr><tr><td>Installed in browser</td><td>External software component</td></tr></table> | Add-ons | Plug-ins | Add extra browser features | Run specific multimedia/content | Installed in browser | External software component | (1*2) |
| Add-ons                         | Plug-ins                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |          |                            |                                 |                      |                             |       |
| Add extra browser features      | Run specific multimedia/content                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |          |                            |                                 |                      |                             |       |
| Installed in browser            | External software component                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |          |                            |                                 |                      |                             |       |
| 26.                             | <p>(i) SELECT MONTH ('2026-01-01');<br/>(ii) SELECT YEAR ('2026-01-01');</p>                                                                                                                                                                                                                                                                                                                                                                                                                         | (1*2)   |          |                            |                                 |                      |                             |       |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 27.                                   | <p>(a) Data protection means safeguarding digital information from unauthorized access or misuse.</p> <p>(b) Any two precautions:</p> <ol style="list-style-type: none"> <li>1. Use strong passwords.</li> <li>2. Avoid clicking suspicious links.</li> </ol>                                                                                                                                                                                                                                                                                                | (1*2)                                    |
| 28.                                   | <p><b>(a)</b> import pandas as pd<br/>import numpy as np<br/>arr = np.array(['a','b','c'])<br/>s = pd.Series(arr, index=['first','second','third'])<br/>print(s)</p> <p style="text-align: center;"><b>OR</b></p> <p><b>(b) Output</b></p> <p>a NaN<br/>b 6.0<br/>c 8.0<br/>d NaN</p>                                                                                                                                                                                                                                                                        | (1/2 marks for each step, total 2 marks) |
| <b>SECTION – C (4 × 3 = 12 Marks)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |
| 29.                                   | <p>(i) Phishing</p> <p>(ii) Any two methods:</p> <ol style="list-style-type: none"> <li>1. SMS</li> <li>2. Fake websites</li> </ol> <p>(iii) Information Technology Act, 2000</p>                                                                                                                                                                                                                                                                                                                                                                            | (1*3)                                    |
| 30.                                   | <p>(a) import pandas as pd<br/>s = pd.Series([31,31,30,31],<br/>index=['July','Aug','Sept','Oct'])<br/>print(s)</p> <p style="text-align: center;"><b>OR</b></p> <p>(b) import pandas as pd<br/>DF = pd.read_csv("customer.csv")<br/>print(DF.tail(2))</p>                                                                                                                                                                                                                                                                                                   | (3)                                      |
| 31.                                   | <p>(i) CREATE TABLE PRODUCTS<br/>(PID INT PRIMARY KEY,<br/>PName VARCHAR (30),<br/>PCat CHAR (15),<br/>Price DECIMAL (10,2));</p> <p>(ii) UPDATE PRODUCTS<br/>SET Price = Price + 100<br/>WHERE PCat='Grocery';</p>                                                                                                                                                                                                                                                                                                                                          | 2+1=3                                    |
| 32.                                   | <p><b>(a)</b></p> <p>(i) DELETE FROM SUBJECT WHERE TID = 4;</p> <p>(ii) SELECT TName<br/>FROM TEACHER<br/>WHERE Experience &gt; 5 AND City='Nagpur';</p> <p>(iii) SELECT SubName, TName<br/>FROM SUBJECT, TEACHER<br/>WHERE SUBJECT.TID = TEACHER.TID;</p> <p style="text-align: center;"><b>OR</b></p> <p><b>(b)</b></p> <p>(i) BookId can be considered a candidate key because it uniquely identifies each record.</p> <p>(ii) INSERT INTO LIBRARY VALUES (501,'AI for ALL','Technology',589);</p> <p>(iii) ALTER TABLE LIBRARY ADD Author CHAR (20);</p> | (1*3)                                    |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|     | <b>SECTION – D (2 × 4 = 8 Marks)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |
| 33. | (i) plt.hist<br>(ii) plt<br>(iii) plt.legend()<br>(iv) plt.show()                                                                                                                                                                                                                                                                                                                                                                                                                              | (1*4) |
| 34. | <b>(a)</b><br>(i) SELECT UPPER(RIGHT(GuestName,3)) FROM Guest;<br>(ii) SELECT GuestName, DAYNAME(CheckInDate) FROM Guest;<br>(iii) SELECT MOD(Charges,1000) FROM Guest;<br>(iv) SELECT SUBSTR(GuestName,2,3) FROM Guest;<br><b>OR</b><br><b>(b)</b><br>(i) Hemant<br>Neha<br>Keshav<br>(ii) Hemant 10<br>Keshav 5<br>(iii) March<br>January<br>December<br>(iv)<br>101 1<br>102 NULL<br>103 20<br>104 25                                                                                       | (1*4) |
|     | <b>SECTION – E (3 × 5 = 15 Marks)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |
| 35. | I. Research department should have the main server because it has the maximum number of computers (80).<br>II. Cable Layout:<br>Human Resources ↔ Research<br>Research ↔ Design<br>Design ↔ Technical Support<br>III. <b>Switch</b><br>IV. <b>WAN</b><br>V. <b>Repeater</b>                                                                                                                                                                                                                    | (1*5) |
| 36. | <b>(i)</b><br>import pandas as pd<br># Creating Series<br>Name = pd.Series(['Ananya', 'Karan', 'Simran', 'Rahul', 'Priya'])<br>Course = pd.Series(['B.Sc.', 'B.Tech', 'MCA', 'BCA', 'BA'])<br>Amount = pd.Series([62000, 67000, 64000, 70000, 69000])<br>Scholarship = pd.DataFrame({ 'Name': Name, 'Course': Course, 'Amount': Amount })<br>print(Scholarship)<br><b>(ii)</b> Scholarship.index = ['a','b','c','d','e']<br><b>(iii)</b> Scholarship.drop(Scholarship.index[-1], inplace=True) | 3+2=5 |
| 37. | <b>(a)</b><br>(i) SELECT DATE('2026-01-01 10:10:10');<br>(ii) SELECT LOWER(CustName) FROM Customer;<br>(iii) SELECT LEFT(CityName,4) FROM Location;                                                                                                                                                                                                                                                                                                                                            | (1*5) |

|                                                                                                                                                                                                                                                                                                                                                 |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| (iv) SELECT LTRIM(CITY) FROM EVENT;<br>(v) SELECT AVG(Salary) FROM Employees;<br><p style="text-align: center;"><b>OR</b></p> <b>(b)</b><br>(i) SELECT POW(17,2);<br>(ii) SELECT DAY(Hire_Date) FROM Employee;<br>(iii) SELECT MAX(BillAmount) FROM Bill;<br>(iv) SELECT TRIM(Location) FROM Branch;<br>(v) SELECT SUM(tot_sal) FROM Employees; |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

**KENDRIYA VIDYALAYA SANGATHAN**  
**UNSOLVED SAMPLE QUESTION PAPER**  
**SUBJECT: INFORMATICS PRACTICES (065)**

Class - XII  
M.M.- 70  
Hrs

Set: 1  
Time - 03:00

**General Instructions:**

1. Please check this question paper contains 37 questions.
2. All questions are compulsory. However, internal choices have been provided in few questions.  
Attempt only one of the choices in such questions.
3. The paper is divided into 5 Sections- A, B, C, D and E.
4. Section A consists of 21 questions (1 to 21). Each question carries 1 Mark.
5. Section B consists of 7 questions (22 to 28). Each question carries 2 Marks.
6. Section C consists of 4 questions (29 to 32). Each question carries 3 Marks.
7. Section D consists of 2 questions (33 to 34). Each question carries 4 Marks.
8. Section E consists of 3 questions (35 to 37). Each question carries 5 Marks.
9. All programming questions are to be answered using Python Language only.
10. In case of MCQ, text of the correct answer should also be written.

|    | <b>SECTION – A (21 × 1 = 21 Marks)</b>                                                                                                                                                                                                                                               |     |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1. | A DataFrame is created by a dictionary carrying 3 keys and 4 values against each of the keys. How many columns will be there in the DataFrame?<br>(a) 2                      (b) 1                      (c) 3                      (d) 4                                             | (1) |
| 2. | Write the output of the following SQL query.<br>SELECT INSTR('INTERNATIONAL', 'NA');<br>(a) 5                      (b) 6                      (c) 11                      (d) 2                                                                                                      | (1) |
| 3. | Disha wanted a software for her official documentation work, but she does not want to pay for it. Which type of software she should purchase?<br>(a) Closed software                      (b) Free software<br>(c) Commercial software                      (d) Proprietary software | (1) |
| 4. | The correct statement to read from a CSV file in a dataframe df is:<br>(a) df.read_csv(file)                      (b) file.read_csv(df)<br>(c) df=pandas.read(file)                      (d) df=pandas.read_csv(file)                                                                | (1) |
| 5. | Which of the following is not a browser?<br>(a) Mozilla Firefox    (b) Google Chrome                      (c) Internet Explorer                      (d) Yahoo                                                                                                                       | (1) |
| 6. | Help Shreya to write the command to display the name of the youngest student.<br>(a) SELECT Name, MIN(DOB) FROM Student;<br>(b) SELECT Name, MAX(DOB) FROM Student;<br>(c) SELECT Name, MIN(DOB) FROM Student GROUP BY Name;<br>(d) SELECT Name, MAXIMUM(DOB) FROM Student;          | (1) |
| 7. | The term Intellectual property rights cover<br>(a) Trademark                      (b) Copyright<br>(c) Patents                      (d) All of these                                                                                                                                 | (1) |
| 8. | State whether the following statement is True or False:<br>Slicing can be used to extract a specific portion from a Panda Series.                                                                                                                                                    | (1) |
| 9. | Identify the SQL command used to delete a relation (table) from a relational database.<br>(a) DROP TABLE<br>(b) REMOVE TABLE<br>(c) DELETE TABLE<br>(d) ERASE TABLE                                                                                                                  | (1) |

| 10.          | A _____ is a device that connects the organisation's network with the outside world of the Internet.<br>(a) Hub (b) Modem (c) Gateway (d) Repeater                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------|-------------|--|----|-------|----|-----------------------------------------------|----|-------------|----|----------------------------------------|----|---------|----|-----------------------------------|----|------------|----|---------------------------------|-----|
| 11.          | Which of the following SQL function is used to count the non-NULL values in a column named column_name?<br>(a) COUNT(*) (b) COUNT(column_name)<br>(c) SUM(column_name) (d) AVG(column_name)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 12.          | When two Pandas Series with different indices are added, the result is _____.<br>(a) Error occurs<br>(b) Indices are ignored, and elements are added in order<br>(c) The result has all indices, with missing values filled as NaN<br>(d) Only the common indices are retained in the result                                                                                                                                                                                                                                                                                                                                                                                         | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 13.          | e-waste refers to:<br>(a) Software that has become obsolete<br>(b) Data that has been deleted from a storage device<br>(c) Viruses that infect computers<br>(d) Electronic devices that are no longer in use                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 14.          | Fill in the Blank<br>The <b>COUNT(*)</b> function provides the total number of _____ within a relation (table) in a relational database.<br>(a) Columns (b) Unique values (c) Not-null values (d) Rows                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 15.          | What is the correct syntax for renaming a column in a DataFrame?<br>(a) df.rename(columns={'old_name': 'new_name'})<br>(b) df.rename_column('old_name', 'new_name')<br>(c) df.rename_columns({'old_name': 'new_name'})<br>(d) df.rename('old_name', 'new_name')                                                                                                                                                                                                                                                                                                                                                                                                                      | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 16.          | In which network topology is every node directly connected to every other node?<br>(a) Star (b) Tree (c) Mesh (d) Bus                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 17.          | Predict the output of the following query:<br>SELECT LCASE (MONTHNAME ('2025-05-03'));<br>(a) May (b) March (c) may (d) march                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 18.          | DataFrames can be created from?<br>(a) lists (b) dictionaries (c) series (d) all of the above                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 19.          | Match the following SQL functions/clauses with their descriptions: <table><thead><tr><th colspan="2">SQL Function</th><th colspan="2">Description</th></tr></thead><tbody><tr><td>P.</td><td>MIN()</td><td>1.</td><td>Find the position of a substring in a string.</td></tr><tr><td>Q.</td><td>SUBSTRING()</td><td>2.</td><td>Returns the minimum value in a column.</td></tr><tr><td>R.</td><td>INSTR()</td><td>3.</td><td>Sorts the data based on a column.</td></tr><tr><td>S.</td><td>ORDER BY()</td><td>4.</td><td>Extracts a portion of a string.</td></tr></tbody></table><br>(a) P-2, Q-4, R-3, S-1 (b) P-2, Q-4, R-1, S-3<br>(c) P-4, Q-3, R-2, S-1 (d) P-4, Q-2, R-1, S-3 | SQL Function |                                               | Description |  | P. | MIN() | 1. | Find the position of a substring in a string. | Q. | SUBSTRING() | 2. | Returns the minimum value in a column. | R. | INSTR() | 3. | Sorts the data based on a column. | S. | ORDER BY() | 4. | Extracts a portion of a string. | (1) |
| SQL Function |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Description  |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| P.           | MIN()                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.           | Find the position of a substring in a string. |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| Q.           | SUBSTRING()                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2.           | Returns the minimum value in a column.        |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| R.           | INSTR()                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3.           | Sorts the data based on a column.             |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| S.           | ORDER BY()                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4.           | Extracts a portion of a string.               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 20.          | <b>Assertion (A):</b> To use the Pandas library in a Python program, one must import it.<br><b>Reason (R):</b> The only alias name that can be used with the Pandas library is pd.<br>(a) Both A and R are true and R is the correct explanation for A.<br>(b) Both A and R are true and R is not the correct explanation for A.<br>(c) A is True but R is False. (d) A is false but R is True.                                                                                                                                                                                                                                                                                      | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |
| 21.          | <b>Assertion (A):</b> In SQL, <b>CREATE TABLE</b> is a Data Definition Language (DDL) Command.<br><b>Reason (R):</b> DDL commands are used to create, modify, or remove database structures, such as tables.<br>(a) Both A and R are true and R is the correct explanation for A.<br>(b) Both A and R are true and R is not the correct explanation for A.<br>(c) A is True but R is False. (d) A is false but R is True.                                                                                                                                                                                                                                                            | (1)          |                                               |             |  |    |       |    |                                               |    |             |    |                                        |    |         |    |                                   |    |            |    |                                 |     |

|     | SECTION – B (7 × 2 = 14 Marks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |        |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|--------|-----|------|--------|------|-------|----|-------|--------|----|-----|-------|----|---------|----|------|----|----------|-----|
| 22. | <p>(A) What is a Series in Python Pandas? Also, give a suitable example to support your answer.</p> <p style="text-align: center;"><b>OR</b></p> <p>(B) Find the error and rewrite the below code to create a series properly.</p> <pre>import panda as pl Lst1=[1,2,3] Lst2=list('ABC') S1=pl.Series(Lst1, rows=Lst2)</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (2)    |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 23. | What is e-waste? Mention any one impact of e-waste on the environment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | (2)    |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 24. | <p>Complete the following code to get the Output given below:</p> <pre>import pandas as _____ L1 = [[“Aman”,45], [“Ankit”, 56], [“_____”,67]] DF = pd._____(L1, _____ = [“Name”, “Marks”], index = [ _____ ] ) print(DF)<p><b>OUTPUT :</b></p><table><tr><td></td><td>Name</td><td>Marks</td></tr><tr><td>1</td><td>Aman</td><td>45</td></tr><tr><td>2</td><td>Ankit</td><td>56</td></tr><tr><td>3</td><td>Sunita</td><td>67</td></tr></table></pre>                                                                                                                                                                                                                                                                                                                                                      |        | Name | Marks  | 1   | Aman | 45     | 2    | Ankit | 56 | 3     | Sunita | 67 | (2) |       |    |         |    |      |    |          |     |
|     | Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks  |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 1   | Aman                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 45     |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 2   | Ankit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 56     |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 3   | Sunita                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 67     |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 25. | <p>Mehul, a Class XII student, has written code for a website but is unsure how to make it available on the Internet. Explain to Mehul the role of a web server and web hosting in ensuring availability of his website on the internet.</p> <p style="text-align: center;"><b>OR</b></p> <p>Unnati is doing a course in networking. She is unable to understand the concept of URL. Help her by explaining it with the help of suitable example.</p>                                                                                                                                                                                                                                                                                                                                                     | (2)    |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 26. | <p>Observe the following tables TRANSACTIONS and CUSTOMERS carefully and answer the questions that follow:</p> <p style="text-align: center;"><b>TABLE: TRANSACTIONS</b></p> <table><tr><td>TNO</td><td>TYPE</td><td>AMOUNT</td><td>CNO</td></tr><tr><td>T1</td><td>CREDIT</td><td>1000</td><td>C3</td></tr><tr><td>T2</td><td>DEBIT</td><td>1500</td><td>C1</td></tr></table> <p style="text-align: center;"><b>TABLE: CUSTOMERS</b></p> <table><tr><td>CNO</td><td>CNAME</td></tr><tr><td>C1</td><td>ZEESHAN</td></tr><tr><td>C2</td><td>AMAN</td></tr><tr><td>C3</td><td>JASPREET</td></tr></table> <p>(i) What is the Degree of the table TRANSACTIONS &amp; What is the cardinality of the table CUSTOMERS?</p> <p>(ii) Identify the primary key and candidate keys from the table TRANSACTIONS.</p> | TNO    | TYPE | AMOUNT | CNO | T1   | CREDIT | 1000 | C3    | T2 | DEBIT | 1500   | C1 | CNO | CNAME | C1 | ZEESHAN | C2 | AMAN | C3 | JASPREET | (2) |
| TNO | TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | AMOUNT | CNO  |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| T1  | CREDIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1000   | C3   |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| T2  | DEBIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1500   | C1   |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| CNO | CNAME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |        |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| C1  | ZEESHAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |        |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| C2  | AMAN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| C3  | JASPREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 27. | Define digital footprints. Differentiate between active and passive digital footprints.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | (2)    |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |
| 28. | <p>(A) Neelakshi is writing a Python program to create a DataFrame using a list of dictionaries. However, her code contains some mistakes. Identify the errors, rewrite the correct code, and underline the corrections made.</p> <pre>import Pandas as pd D1 = {'Name': 'Rahul', 'Age': 25} D2 = {'Name': 'Prateek', 'Age': 30} D3 = {'Name': 'Anisha”, 'Age': 28} data = [D1, D2, D3)</pre>                                                                                                                                                                                                                                                                                                                                                                                                             | (2)    |      |        |     |      |        |      |       |    |       |        |    |     |       |    |         |    |      |    |          |     |

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|---------|---------|---------|-------------|-----------------|--------------|------|--------------|--------------|----|----------------|-------------|-------|----------------|---------|------------|-------|----|------|------------|-------|----|-----|
|                 | <div>df = pd.DataFrame(data)</div> <div>print(df)</div> <div>OR</div> <div>(B) Complete the given Python code to get the required output (ignore the dtype attribute) as:</div> <div>Output:</div> <div>Chhattisgarh Raipur</div> <div>Madhya Pradesh Bhopal</div> <div>Rajasthan Jaipur</div> <div>Code:</div> <div>import _____ as pd</div> <div>data = ['Raipur','_____', 'Jaipur']</div> <div>indx = ['Chhattisgarh','Madhya Pradesh','Rajasthan']</div> <div>s = pd.Series(_____, indx)</div> <div>print(_____)</div>                                                                                                                                                      |             |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
|                 | SECTION – C (4 × 3 = 12 Marks)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 29.             | How can one protect from cyber fraud? (Write minimum three points)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | (3)         |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 30.             | <div>(A) Write a program to display only those values greater than 200 in the given Series “S1”</div> <div>0300</div> <div>1100</div> <div>21200</div> <div>31700</div> <div>OR</div> <div>(B) Write the code to create the dataframe from given data-</div> <div>L1 = [ [“Jane”, “Cricket”, “7<sup>th</sup>”], [“Johny”, “Hockey”, “11<sup>th</sup>”], [“Saksham”, “Basket ball”, “9<sup>th</sup>”]</div>                                                                                                                                                                                                                                                                      | (3)         |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 31.             | <div>Kumud has to create a database name RESULT in MYSQL. She now needs to create a table REPORT_CARD in the database. The table REPORT_CARD has the following structure:</div> <div>Table: REPORT_CARD</div> <table><tr><td>FIELD NAME</td><td>DATA TYPE</td><td>REMARKS</td></tr><tr><td>ROLL NO</td><td>INTEGER</td><td>PRIMARY KEY</td></tr><tr><td>NAME OF STUDENT</td><td>VARCHAR (30)</td><td></td></tr><tr><td>ADDRESS</td><td>VARCHAR (35)</td><td></td></tr><tr><td>SUBJECT1 MARKS</td><td>INTEGER</td><td></td></tr><tr><td>SUBJECT2 MARKS</td><td>INTEGER</td><td></td></tr></table> <div>Suggest her to complete the task by using appropriate SQL commands.</div> | FIELD NAME  | DATA TYPE | REMARKS | ROLL NO | INTEGER | PRIMARY KEY | NAME OF STUDENT | VARCHAR (30) |      | ADDRESS      | VARCHAR (35) |    | SUBJECT1 MARKS | INTEGER     |       | SUBJECT2 MARKS | INTEGER |            | (3)   |    |      |            |       |    |     |
| FIELD NAME      | DATA TYPE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | REMARKS     |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| ROLL NO         | INTEGER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | PRIMARY KEY |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| NAME OF STUDENT | VARCHAR (30)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| ADDRESS         | VARCHAR (35)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| SUBJECT1 MARKS  | INTEGER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| SUBJECT2 MARKS  | INTEGER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |             |           |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 32.             | <div>(A) Write SQL queries for (i) to (iii):</div> <div>Table: SALESPERSON</div> <table><tr><td>CODE</td><td>NAME</td><td>SALARY</td><td>ITCODE</td></tr><tr><td>1001</td><td>TANDEEP JHA</td><td>60000</td><td>I2</td></tr><tr><td>1002</td><td>YOGRAJ SINHA</td><td>70000</td><td>I5</td></tr><tr><td>1003</td><td>TENZIN JACK</td><td>45000</td><td>I2</td></tr><tr><td>1005</td><td>ANOKHI RAJ</td><td>50000</td><td>I7</td></tr><tr><td>1004</td><td>TARANA SEN</td><td>55000</td><td>I7</td></tr></table>                                                                                                                                                                 | CODE        | NAME      | SALARY  | ITCODE  | 1001    | TANDEEP JHA | 60000           | I2           | 1002 | YOGRAJ SINHA | 70000        | I5 | 1003           | TENZIN JACK | 45000 | I2             | 1005    | ANOKHI RAJ | 50000 | I7 | 1004 | TARANA SEN | 55000 | I7 | (3) |
| CODE            | NAME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | SALARY      | ITCODE    |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 1001            | TANDEEP JHA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 60000       | I2        |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 1002            | YOGRAJ SINHA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 70000       | I5        |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 1003            | TENZIN JACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 45000       | I2        |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 1005            | ANOKHI RAJ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 50000       | I7        |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |
| 1004            | TARANA SEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 55000       | I7        |         |         |         |             |                 |              |      |              |              |    |                |             |       |                |         |            |       |    |      |            |       |    |     |

Table: ITEM

| ITCODE | ITEMTYPE   | TURNOVER |
|--------|------------|----------|
| I5     | STATIONARY | 3400000  |
| I7     | HOISTERY   | 6500000  |
| I2     | BAKERY     | 10090000 |

- (i) To display the CODE and NAME of all sales-person having "I7" item Type Code from the table SALESPERSON.
- (ii) To display all details from SALES-PERSON in descending order of SALARY.
- (iii) To display NAME of all the salesperson table along with their corresponding ITEMTYPE from the ITEM table.

**OR**

**(B)** In a Database - SAMS and VENDOR are two tables with the following information.

Write MySQL queries for (i) to (iii), based on tables SAMS and VENDOR:

Table: SAMS

| ICode | IName           | Price | Colour | VCode |
|-------|-----------------|-------|--------|-------|
| S001  | Refrigerator    | 20000 | Blue   | P01   |
| S002  | Mobile Phone    | 45000 | Black  | P02   |
| S003  | LCD             | 60000 | Silver | P03   |
| S004  | Washing Machine | 12500 | Smoke  | P01   |
| S005  | Air Conditioner | 16000 | White  | P03   |

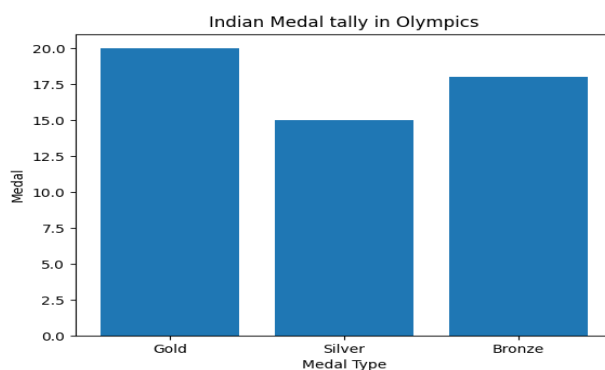
Table: VENDOR

| VCode | VNAME  |
|-------|--------|
| P01   | Satish |
| P02   | Manoj  |
| P03   | Subodh |
| P04   | Jacob  |

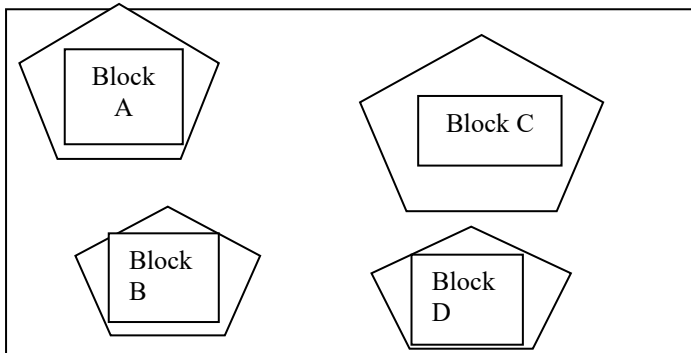
- (i) To display ICode, IName and VName of all the vendors, who manufacture "Refrigerator".
- (ii) To display IName, ICode, VName and Price of all the products whose price is more than 20000.
- (iii) To display vendor names and names of all items manufactured by vendor whose code is "P03".

**SECTION – D (2 × 4 = 8 Marks)**

33.



(4)

|                                       | Write Python code to plot a bar chart for India’s medal tally as shown below:<br>Also give suitable python statement to save this chart.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |          |            |       |            |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|------------|-------|------------|-----|--------|------|-------|----|----------|------------|-------|---|------|--------|----|---------|------------|-------|---|------|---------|----|-------|------------|-------|---|------|----------|----|---------|------------|-------|---|------|----------|----|-------|------------|-------|---|------|--------|----|---------|------------|-------|---|-----|-------|--------|---------|-----------|-----|-------|---|----------------|--------|----|--------|---|-----|---|-----------|---------|----|-----|---|-----|---|-----------|---------------|------|----------|---|-----|---|---------------|--------|------|---------|---|-----|---|-------------------|--------|----|-----|---|-----|---|------------------|--------|-----|----------|---|----|---|-------|-------|------|--------|---|------|---|---------------|-------|-----|--------|---|-----|---|---------------------|---------|------|-----|---|----|----|-----------------|---------|------|--------|---|-----|-----|
| 34.                                   | <p><b>(A)</b> Write SQL commands for the following:</p> <p style="text-align: center;">Table: TEACHER</p> <table><tr><th>TID</th><th>NAME</th><th>AGE</th><th>DEPT</th><th>DATEOFJOIN</th><th>SAL</th><th>GENDER</th></tr><tr><td>T118</td><td>Navin</td><td>40</td><td>Computer</td><td>2010-01-10</td><td>12000</td><td>M</td></tr><tr><td>T107</td><td>Chetna</td><td>37</td><td>History</td><td>2008-03-24</td><td>20000</td><td>F</td></tr><tr><td>T105</td><td>Sandeep</td><td>46</td><td>Maths</td><td>2006-12-12</td><td>30000</td><td>M</td></tr><tr><td>T110</td><td>Sangeeta</td><td>35</td><td>History</td><td>2010-07-01</td><td>25000</td><td>F</td></tr><tr><td>T101</td><td>Rudransh</td><td>42</td><td>Maths</td><td>2004-09-05</td><td>40000</td><td>M</td></tr><tr><td>T121</td><td>Neeraj</td><td>38</td><td>Physics</td><td>2011-04-01</td><td>28000</td><td>M</td></tr></table> <p>(i) To show information about the teachers of the history department.<br/>(ii) To list the names of teachers earning a salary between 20000 and 30000.<br/>(iii) Increase the salary by 10% for Maths departments.<br/>(iv) To delete the record of teacher Neeraj.</p> <p style="text-align: center;"><b>OR</b></p> <p><b>(B)</b> Consider the following table Bookhouse.</p> <p style="text-align: center;">Table: Bookhouse</p> <table><tr><th>No.</th><th>Title</th><th>Author</th><th>Subject</th><th>Publisher</th><th>Qty</th><th>Price</th></tr><tr><td>1</td><td>Data Structure</td><td>Lips C</td><td>DS</td><td>McGraw</td><td>4</td><td>217</td></tr><tr><td>2</td><td>DOS Guide</td><td>Nortron</td><td>OS</td><td>PHI</td><td>3</td><td>175</td></tr><tr><td>3</td><td>Turbo C++</td><td>Robert Lafore</td><td>Prog</td><td>Galgotia</td><td>5</td><td>270</td></tr><tr><td>4</td><td>Dbase Dummies</td><td>Palmer</td><td>DBMS</td><td>PustakM</td><td>7</td><td>130</td></tr><tr><td>5</td><td>Mastering Windows</td><td>Cowart</td><td>OS</td><td>BPB</td><td>1</td><td>225</td></tr><tr><td>6</td><td>Computer Studies</td><td>French</td><td>FND</td><td>Galgotia</td><td>2</td><td>75</td></tr><tr><td>7</td><td>COBOL</td><td>Stern</td><td>Prog</td><td>John W</td><td>4</td><td>1000</td></tr><tr><td>8</td><td>Guide Network</td><td>Freed</td><td>NET</td><td>Zpress</td><td>3</td><td>200</td></tr><tr><td>9</td><td>Basic for Beginners</td><td>Nortron</td><td>Prog</td><td>BPB</td><td>3</td><td>40</td></tr><tr><td>10</td><td>Advanced Pascal</td><td>Schildt</td><td>Prog</td><td>McGraw</td><td>4</td><td>350</td></tr></table> <p>Predict the output of the following queries based on the table Bookhouse given below:<br/>(i) SELECT LEFT(Title,2) from Bookhouse where publisher=”McGraw”;<br/>(ii) SELECT “AVG Price” from Bookhouse where Author=”Nortron”;<br/>(iii) SELECT SUM(Price) “Total Price” from Bookhouse where Subject=”OS”;<br/>(iv) SELECT Title, Author FROM Bookhouse where Price BETWEEN 130 AND 300;</p> | TID           | NAME     | AGE        | DEPT  | DATEOFJOIN | SAL | GENDER | T118 | Navin | 40 | Computer | 2010-01-10 | 12000 | M | T107 | Chetna | 37 | History | 2008-03-24 | 20000 | F | T105 | Sandeep | 46 | Maths | 2006-12-12 | 30000 | M | T110 | Sangeeta | 35 | History | 2010-07-01 | 25000 | F | T101 | Rudransh | 42 | Maths | 2004-09-05 | 40000 | M | T121 | Neeraj | 38 | Physics | 2011-04-01 | 28000 | M | No. | Title | Author | Subject | Publisher | Qty | Price | 1 | Data Structure | Lips C | DS | McGraw | 4 | 217 | 2 | DOS Guide | Nortron | OS | PHI | 3 | 175 | 3 | Turbo C++ | Robert Lafore | Prog | Galgotia | 5 | 270 | 4 | Dbase Dummies | Palmer | DBMS | PustakM | 7 | 130 | 5 | Mastering Windows | Cowart | OS | BPB | 1 | 225 | 6 | Computer Studies | French | FND | Galgotia | 2 | 75 | 7 | COBOL | Stern | Prog | John W | 4 | 1000 | 8 | Guide Network | Freed | NET | Zpress | 3 | 200 | 9 | Basic for Beginners | Nortron | Prog | BPB | 3 | 40 | 10 | Advanced Pascal | Schildt | Prog | McGraw | 4 | 350 | (4) |
| TID                                   | NAME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | AGE           | DEPT     | DATEOFJOIN | SAL   | GENDER     |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| T118                                  | Navin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 40            | Computer | 2010-01-10 | 12000 | M          |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| T107                                  | Chetna                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 37            | History  | 2008-03-24 | 20000 | F          |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| T105                                  | Sandeep                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 46            | Maths    | 2006-12-12 | 30000 | M          |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| T110                                  | Sangeeta                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 35            | History  | 2010-07-01 | 25000 | F          |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| T101                                  | Rudransh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 42            | Maths    | 2004-09-05 | 40000 | M          |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| T121                                  | Neeraj                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 38            | Physics  | 2011-04-01 | 28000 | M          |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| No.                                   | Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Author        | Subject  | Publisher  | Qty   | Price      |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 1                                     | Data Structure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Lips C        | DS       | McGraw     | 4     | 217        |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 2                                     | DOS Guide                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Nortron       | OS       | PHI        | 3     | 175        |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 3                                     | Turbo C++                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Robert Lafore | Prog     | Galgotia   | 5     | 270        |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 4                                     | Dbase Dummies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Palmer        | DBMS     | PustakM    | 7     | 130        |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 5                                     | Mastering Windows                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Cowart        | OS       | BPB        | 1     | 225        |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 6                                     | Computer Studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | French        | FND      | Galgotia   | 2     | 75         |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 7                                     | COBOL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Stern         | Prog     | John W     | 4     | 1000       |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 8                                     | Guide Network                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Freed         | NET      | Zpress     | 3     | 200        |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 9                                     | Basic for Beginners                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Nortron       | Prog     | BPB        | 3     | 40         |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 10                                    | Advanced Pascal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Schildt       | Prog     | McGraw     | 4     | 350        |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| <b>SECTION – E (3 × 5 = 15 Marks)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |               |          |            |       |            |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |
| 35.                                   | <p>Vibhav Industries has set up its new center at Mangalore for its office and web-based activities. It has 4 blocks of buildings as shown in the diagram below:</p> <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (5)           |          |            |       |            |     |        |      |       |    |          |            |       |   |      |        |    |         |            |       |   |      |         |    |       |            |       |   |      |          |    |         |            |       |   |      |          |    |       |            |       |   |      |        |    |         |            |       |   |     |       |        |         |           |     |       |   |                |        |    |        |   |     |   |           |         |    |     |   |     |   |           |               |      |          |   |     |   |               |        |      |         |   |     |   |                   |        |    |     |   |     |   |                  |        |     |          |   |    |   |       |       |      |        |   |      |   |               |       |     |        |   |     |   |                     |         |      |     |   |    |    |                 |         |      |        |   |     |     |

Center to center distance between various blocks:

|                    |       |
|--------------------|-------|
| Block A to Block B | 50 m  |
| Block B to Block C | 150 m |
| Block C to Block D | 25 m  |
| Block A to Block D | 170 m |
| Block B to Block D | 125 m |
| Block A to Block C | 90 m  |

Expected number of computers in each building are as follows:

|         |     |
|---------|-----|
| Block A | 25  |
| Block B | 50  |
| Block C | 125 |
| Block D | 10  |

- Suggest the device which is used to connect all the nodes in particular block.
- Suggest the most suitable wire to connect all the blocks with high – speed data transfer.
- The organization is planning to link its front office situated in the city in a hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed.
- Suggest the appropriate protocol/ way to do the audio-video communication between the different parts of the world.
- What type of network would be formed if the Mangalore office is connected to their New York office?

36. On the basis of the given data set, answer the questions below:  
 ExpenditureData = {'Country' : ['Brazil', 'India', 'United Kingdom', 'Nigeria', 'China', 'Nepal'],  
 'Expenditure' : [785300000, 530780000, 694582000, 130581000, 407191800, 4754000],  
 'GrowthRate': [15, 18.6, 13.79, 14.87, 20.86, 12.54],  
 'UpdateDate': ['2016-03', '2016-08', '2016-02', '2016-01', '2016-09', '2016-05']}

|   | Country        | Expenditure | GrowthRate | UpdateDate |
|---|----------------|-------------|------------|------------|
| 0 | Brazil         | 785300000   | 15.00      | 2016-03    |
| 1 | India          | 530780000   | 18.60      | 2016-08    |
| 2 | United Kingdom | 694582000   | 13.79      | 2016-02    |
| 3 | Nigeria        | 130581000   | 14.87      | 2016-01    |
| 4 | China          | 407191800   | 20.86      | 2016-09    |
| 5 | Nepal          | 4754000     | 12.54      | 2016-05    |

- Write the command to create the data frame from the given lists.
- To display the following columns 'Country', 'Expenditure', 'UpdateDate'.
- To display the first and second record.
- To display the records of the countries whose growth rate is greater than 18.
- To add the new column GDP\_Growth\_rate.

37. (A) Consider the following table FITNESS with details about fitness products being sold in the store:

| PCODE | PNAME      | PRICE | MANUFACTURER |
|-------|------------|-------|--------------|
| P1    | TREAD MILL | 11000 | COSCORE      |
| P2    | BIKE       | 22000 | AONE         |

|    |                  |       |          |
|----|------------------|-------|----------|
| P3 | CROSS<br>TRAINER | 13000 | RELIABLE |
| P4 | MULTI GYM        | 33000 | COSCORE  |

Write SQL Commands for (i) to (v)

- (i) To add a new row for product with the details.  
P5, 'MESSAGE CHAIR', 27000, 'REGROSENE'
- (ii) Add a new column DATE\_OF\_MANUFACTURE of suitable datatype.
- (iii) To display products of AONE MANUFACTURER.
- (iv) Delete the record of MULTIGYM.
- (v) Change the price of TREADMILL from 11000 to 35000.

**OR**

Write suitable SQL query for the following:

- (i) Round the value of pi (3.14159) to two decimal places.
- (ii) Calculate the remainder when 125 is divided by 6.
- (iii) Display the number of characters in the word 'Raipur'.
- (iv) Display the first 5 characters from the word 'Kendriya Vidyalaya'.
- (v) Display details from '**name**' column (attribute), in the '**Report\_Card**' table, after removing any leading and trailing spaces.

**KENDRIYA VIDYALAYA SANGATHAN**  
**UNSOLVED SAMPLE QUESTION PAPER**  
**SUBJECT: INFORMATICS PRACTICES (065)**

Class - XII  
M.M.- 70  
Hrs

Set: 2  
Time - 03:00

**General Instructions:**

1. Please check this question paper contains 37 questions.
2. All questions are compulsory. However, internal choices have been provided in few questions.

Attempt only one of the choices in such questions.

3. The paper is divided into 5 Sections- A, B, C, D and E.
4. Section A consists of 21 questions (1 to 21). Each question carries 1 Mark.
5. Section B consists of 7 questions (22 to 28). Each question carries 2 Marks.
6. Section C consists of 4 questions (29 to 32). Each question carries 3 Marks.
7. Section D consists of 2 questions (33 to 34). Each question carries 4 Marks.
8. Section E consists of 3 questions (35 to 37). Each question carries 5 Marks.
9. All programming questions are to be answered using Python Language only.
10. In case of MCQ, text of the correct answer should also be written.

| <b>SECTION – A (21 × 1 = 21 Marks)</b> |                                                                                                                                                               |     |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1.                                     | Which function is used to display first five rows of a DataFrame?<br>(a) head() (b) tail() (c) info() (d) shape()                                             | (1) |
| 2.                                     | Identify the output:<br>SELECT UCASE("informatics");<br>(a) Informatics (b) INFORMATICS (c) informatics (d) Informatics<br>Practices (a) 5 (b) 6 (c) 11 (d) 2 | (1) |
| 3.                                     | Which among the following is an Open Source Operating System?<br>(a) Windows (b) Linux (c) MS Office (d) Oracle                                               | (1) |
| 4.                                     | Which command is used to import Pandas library?<br>(a) import pandas as pd (b) include pandas (c) using pandas (d) import pd                                  | (1) |
| 5.                                     | Which of the following is a search engine?<br>(a) Firefox (b) Chrome (c) Yahoo (d) Edge                                                                       | (1) |
| 6.                                     | Which SQL clause is used to arrange records in ascending or descending order?<br>(a) GROUP BY (b) ORDER BY (c) SORT BY (d) ARRANGE                            | (1) |
| 7.                                     | Copyright protects:<br>(a) Literary work (b) Software (c) Music (d) All of these                                                                              | (1) |
| 8.                                     | State True or False:<br>“A DataFrame is two-dimensional data structure.”                                                                                      | (1) |
| 9.                                     | Which SQL command is used to remove all records from a table permanently?<br>(a) DELETE (b) REMOVE (c) CLEAR (d) ERASE                                        | (1) |
| 10.                                    | A device used to forward data packets between computer networks is:<br>(a) Router (b) Repeater (c) Switch (d) Hub                                             | (1) |
| 11.                                    | Which SQL function returns the maximum value?<br>(a) MAX() (b) HIGH() (c) TOP() (d) LARGE()                                                                   | (1) |
| 12.                                    | Which symbol is used for comments in Python?<br>(a) // (b) # (c) /* */ (d) --                                                                                 | (1) |

| 13.                            | Phishing is related to:<br>(a) Online fraud            (b) Data compression            (c) Antivirus            (d) Web hosting                                                                                                                                                                                                                                                                                                                             | (1)      |          |          |                |            |                  |          |                |          |                   |     |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------------|------------|------------------|----------|----------------|----------|-------------------|-----|
| 14.                            | Fill in the blank:<br>The _____ clause is used to filter records in SQL.<br>(a) ORDER BY            (b) WHERE            (c) GROUP BY            (d) HAVING                                                                                                                                                                                                                                                                                                 | (1)      |          |          |                |            |                  |          |                |          |                   |     |
| 15.                            | Which method is used to display statistical summary of DataFrame?<br>(a) info()            (b) summary()            (c) describe()            (d) stat()                                                                                                                                                                                                                                                                                                    | (1)      |          |          |                |            |                  |          |                |          |                   |     |
| 16.                            | Which topology uses a central connecting device?<br>(a) Bus            (b) Ring            (c) Star            (d) Mesh                                                                                                                                                                                                                                                                                                                                     | (1)      |          |          |                |            |                  |          |                |          |                   |     |
| 17.                            | Predict the output:<br>SELECT LENGTH("COMPUTER");<br>(a) 7            (b) 8            (c) 9            (d) 10                                                                                                                                                                                                                                                                                                                                              | (1)      |          |          |                |            |                  |          |                |          |                   |     |
| 18.                            | Which of the following can be used to create a Pandas Series?<br>(a) List            (b) Dictionary            (c) Tuple            (d) All of these                                                                                                                                                                                                                                                                                                        | (1)      |          |          |                |            |                  |          |                |          |                   |     |
| 19.                            | Match the following: <table border="1"><thead><tr><th>Column A</th><th>Column B</th></tr></thead><tbody><tr><td>P. AVG()</td><td>1. Counts rows</td></tr><tr><td>Q. COUNT()</td><td>2. Average value</td></tr><tr><td>R. SUM()</td><td>3. Total value</td></tr><tr><td>S. MIN()</td><td>4. Smallest value</td></tr></tbody></table><br>(a) P-2, Q-1, R-3, S-4            (b) P-1, Q-2, R-3, S-4<br>(c) P-2, Q-3, R-1, S-4            (d) P-4, Q-1, R-2, S-3 | Column A | Column B | P. AVG() | 1. Counts rows | Q. COUNT() | 2. Average value | R. SUM() | 3. Total value | S. MIN() | 4. Smallest value | (1) |
| Column A                       | Column B                                                                                                                                                                                                                                                                                                                                                                                                                                                    |          |          |          |                |            |                  |          |                |          |                   |     |
| P. AVG()                       | 1. Counts rows                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |          |          |                |            |                  |          |                |          |                   |     |
| Q. COUNT()                     | 2. Average value                                                                                                                                                                                                                                                                                                                                                                                                                                            |          |          |          |                |            |                  |          |                |          |                   |     |
| R. SUM()                       | 3. Total value                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |          |          |                |            |                  |          |                |          |                   |     |
| S. MIN()                       | 4. Smallest value                                                                                                                                                                                                                                                                                                                                                                                                                                           |          |          |          |                |            |                  |          |                |          |                   |     |
| 20.                            | <b>Assertion (A): Pandas provides powerful data analysis tools.</b><br><b>Reason (R): Pandas supports DataFrame and Series data structures.</b><br>(a) Both A and R are true and R is correct explanation<br>(b) Both A and R are true but R is not correct explanation<br>(c) A is true but R is false<br>(d) A is false but R is true                                                                                                                     | (1)      |          |          |                |            |                  |          |                |          |                   |     |
| 21.                            | <b>Assertion (A): SQL stands for Structured Query Language.</b><br><b>Reason (R): SQL is used for managing relational databases.</b><br>(a) Both A and R are true and R is correct explanation<br>(b) Both A and R are true but R is not correct explanation<br>(c) A is true but R is false<br>(d) A is false but R is true                                                                                                                                | (1)      |          |          |                |            |                  |          |                |          |                   |     |
| SECTION – B (7 × 2 = 14 Marks) |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |          |          |          |                |            |                  |          |                |          |                   |     |
| 22.                            | (A) What is DataFrame in Pandas? Give one example.<br><b>OR</b><br>(B) Identify the errors and rewrite the correct code:<br>import pandases as pd<br>data=[10,20,30]<br>s=pd.series(data)<br>print(S)                                                                                                                                                                                                                                                       | (2)      |          |          |                |            |                  |          |                |          |                   |     |
| 23.                            | Define plagiarism. Mention one way to avoid plagiarism.                                                                                                                                                                                                                                                                                                                                                                                                     | (2)      |          |          |                |            |                  |          |                |          |                   |     |
| 24.                            | Complete the following code:<br>import pandas as _____<br>D1={"Name":["Rohit","Aman","Sneha"],"Marks":[67,89,92]}<br>df=pd. _____ (D1)                                                                                                                                                                                                                                                                                                                      | (2)      |          |          |                |            |                  |          |                |          |                   |     |

|                                       | print(df)                                                                                                                                                                                                                                                                                                                   |        |       |        |     |      |      |       |       |     |       |       |     |     |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|--------|-----|------|------|-------|-------|-----|-------|-------|-----|-----|
| 25.                                   | Explain the term URL with suitable example.<br><b>OR</b><br>What is web hosting? Why is it required?                                                                                                                                                                                                                        | (2)    |       |        |     |      |      |       |       |     |       |       |     |     |
| 26.                                   | Observe the table STUDENT: <table><tr><th>RNO</th><th>NAME</th><th>CLASS</th></tr><tr><td>1</td><td>Riya</td><td>XII</td></tr><tr><td>2</td><td>Arjun</td><td>XI</td></tr><tr><td>3</td><td>Mehak</td><td>XII</td></tr></table><br><br>(i) Find degree and cardinality of table.<br>(ii) Identify the primary key.          | RNO    | NAME  | CLASS  | 1   | Riya | XII  | 2     | Arjun | XI  | 3     | Mehak | XII | (2) |
| RNO                                   | NAME                                                                                                                                                                                                                                                                                                                        | CLASS  |       |        |     |      |      |       |       |     |       |       |     |     |
| 1                                     | Riya                                                                                                                                                                                                                                                                                                                        | XII    |       |        |     |      |      |       |       |     |       |       |     |     |
| 2                                     | Arjun                                                                                                                                                                                                                                                                                                                       | XI     |       |        |     |      |      |       |       |     |       |       |     |     |
| 3                                     | Mehak                                                                                                                                                                                                                                                                                                                       | XII    |       |        |     |      |      |       |       |     |       |       |     |     |
| 27.                                   | Differentiate between active and passive digital footprints.                                                                                                                                                                                                                                                                | (2)    |       |        |     |      |      |       |       |     |       |       |     |     |
| 28.                                   | (A) Correct the following code:<br>import pandas as pd<br>D={"A":[1,2,3],"B":[4,5,6]}<br>df=pd.DataFrame(D)<br>print(df)<br><b>OR</b><br>(B) Complete the code:<br>import pandas as pd<br>data=["Delhi","Mumbai","Chennai"]<br>index=["Delhi","Maharashtra","Tamil Nadu"]<br>s=pd.Series( _____ , _____ )<br>print( _____ ) | (2)    |       |        |     |      |      |       |       |     |       |       |     |     |
| <b>SECTION – C (4 × 3 = 12 Marks)</b> |                                                                                                                                                                                                                                                                                                                             |        |       |        |     |      |      |       |       |     |       |       |     |     |
| 29.                                   | Write any three measures to stay safe from cyber crime.                                                                                                                                                                                                                                                                     | (3)    |       |        |     |      |      |       |       |     |       |       |     |     |
| 30.                                   | (A) Write Python code to display values greater than 500 from Series S1.<br><br>0    200<br>1    700<br>2    150<br>3    900<br><b>OR</b><br>(B) Create a DataFrame using:<br>L1=[["Rohan",45],["Aditi",78],["Kunal",88]] with column names Name and Marks.                                                                 | (3)    |       |        |     |      |      |       |       |     |       |       |     |     |
| 31.                                   | Write SQL commands to:<br>(i) Create database SCHOOL.<br>(ii) Use the database SCHOOL.<br>(iii) Create table STUDENT with fields:<br>ROLLNO INTEGER PRIMARY KEY,<br>NAME VARCHAR (20),<br>MARKS INTEGER                                                                                                                     | (3)    |       |        |     |      |      |       |       |     |       |       |     |     |
| 32.                                   | (A) Consider the tables EMPLOYEE and DEPARTMENT.<br><b>EMPLOYEE</b> <table><tr><th>EID</th><th>ENAME</th><th>SALARY</th><th>DID</th></tr><tr><td>101</td><td>Ravi</td><td>40000</td><td>D1</td></tr><tr><td>102</td><td>Meena</td><td>50000</td><td>D2</td></tr></table>                                                    | EID    | ENAME | SALARY | DID | 101  | Ravi | 40000 | D1    | 102 | Meena | 50000 | D2  | (3) |
| EID                                   | ENAME                                                                                                                                                                                                                                                                                                                       | SALARY | DID   |        |     |      |      |       |       |     |       |       |     |     |
| 101                                   | Ravi                                                                                                                                                                                                                                                                                                                        | 40000  | D1    |        |     |      |      |       |       |     |       |       |     |     |
| 102                                   | Meena                                                                                                                                                                                                                                                                                                                       | 50000  | D2    |        |     |      |      |       |       |     |       |       |     |     |

|                                                                                                     |                                                                        |                   |                 |             |               |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------------------|-----------------|-------------|---------------|
|                                                                                                     | 103                                                                    | Arjun             | 35000           | D1          |               |
| <b>DEPARTMENT</b>                                                                                   |                                                                        |                   |                 |             |               |
| <b>DID</b>                                                                                          |                                                                        | <b>DNAME</b>      |                 |             |               |
| D1                                                                                                  |                                                                        | SALES             |                 |             |               |
| D2                                                                                                  |                                                                        | HR                |                 |             |               |
| Write SQL queries:                                                                                  |                                                                        |                   |                 |             |               |
| (i) Display names of employees working in D1.                                                       |                                                                        |                   |                 |             |               |
| (ii) Display employee details in descending order of salary.                                        |                                                                        |                   |                 |             |               |
| (iii) Display employee names with department names.                                                 |                                                                        |                   |                 |             |               |
| <b>OR</b>                                                                                           |                                                                        |                   |                 |             |               |
| (B) Write SQL queries for the <b>Product</b> table having following columns – Prod_id, Pname, Price |                                                                        |                   |                 |             |               |
| (i) Display all products with price greater than 10000.                                             |                                                                        |                   |                 |             |               |
| (ii) Display average price of products.                                                             |                                                                        |                   |                 |             |               |
| (iii) Display product names in ascending order.                                                     |                                                                        |                   |                 |             |               |
| <b>SECTION – D (2 × 4 = 8 Marks)</b>                                                                |                                                                        |                   |                 |             |               |
| 33.                                                                                                 | Write Python code to plot a line chart showing monthly sales:          |                   |                 |             | (4)           |
|                                                                                                     |                                                                        | <b>Month</b>      | <b>Sales</b>    |             |               |
|                                                                                                     |                                                                        | Jan               | 120             |             |               |
|                                                                                                     |                                                                        | Feb               | 150             |             |               |
|                                                                                                     |                                                                        | Mar               | 180             |             |               |
|                                                                                                     |                                                                        | Apr               | 170             |             |               |
| Also write statement to save the chart.                                                             |                                                                        |                   |                 |             |               |
| 34.                                                                                                 | (A) Consider table EMPLOYEE:                                           |                   |                 |             | (4)           |
|                                                                                                     |                                                                        | <b>EID</b>        | <b>NAME</b>     | <b>DEPT</b> | <b>SALARY</b> |
|                                                                                                     |                                                                        | E1                | Ravi            | HR          | 25000         |
|                                                                                                     |                                                                        | E2                | Meena           | SALES       | 30000         |
|                                                                                                     |                                                                        | E3                | Aman            | HR          | 28000         |
| Write SQL commands:                                                                                 |                                                                        |                   |                 |             |               |
| (i) Display records of HR department.                                                               |                                                                        |                   |                 |             |               |
| (ii) Display names with salary greater than 26000.                                                  |                                                                        |                   |                 |             |               |
| (iii) Increase salary of SALES department by 5%.                                                    |                                                                        |                   |                 |             |               |
| (iv) Delete record of Aman.                                                                         |                                                                        |                   |                 |             |               |
| <b>OR</b>                                                                                           |                                                                        |                   |                 |             |               |
| (B) Predict output:                                                                                 |                                                                        |                   |                 |             |               |
| (i) SELECT LEFT("COMPUTER",3);                                                                      |                                                                        |                   |                 |             |               |
| (ii) SELECT ROUND (45.678,2);                                                                       |                                                                        |                   |                 |             |               |
| (iii) SELECT MOD (25,4);                                                                            |                                                                        |                   |                 |             |               |
| (iv) SELECT UCASE("python");                                                                        |                                                                        |                   |                 |             |               |
| <b>SECTION – E (3 × 5 = 15 Marks)</b>                                                               |                                                                        |                   |                 |             |               |
| 35.                                                                                                 | A company has four blocks A, B, C and D connected in a campus network. |                   |                 |             | (5)           |
| <b>Distance between blocks:</b>                                                                     |                                                                        |                   |                 |             |               |
|                                                                                                     |                                                                        | <b>Connection</b> | <b>Distance</b> |             |               |
|                                                                                                     |                                                                        | A - B             | 60 m            |             |               |
|                                                                                                     |                                                                        | B - C             | 120 m           |             |               |

|       | <table><tr><td>C - D</td><td>40 m</td></tr><tr><td>A - D</td><td>150 m</td></tr></table> <p><b>Computers in each block:</b></p> <table><tr><th>Block</th><th>Computers</th></tr><tr><td>A</td><td>20</td></tr><tr><td>B</td><td>50</td></tr><tr><td>C</td><td>100</td></tr><tr><td>D</td><td>15</td></tr></table> <p><b>Answer the following:</b></p> <p>(i) Suggest suitable topology.</p> <p>(ii) Suggest suitable cable medium.</p> <p>(iii) Name device used to connect computers within a block.</p> <p>(iv) Suggest communication method for video conferencing.</p> <p>(v) What type of network will connect this office with another office in London?</p>                                                                                                                                                                                     | C - D | 40 m    | A - D | 150 m   | Block | Computers | A     | 20   | B  | 50      | C     | 100 | D  | 15      |      |       |     |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------|-------|---------|-------|-----------|-------|------|----|---------|-------|-----|----|---------|------|-------|-----|
| C - D | 40 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| A - D | 150 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| Block | Computers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| A     | 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| B     | 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| C     | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| D     | 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| 36.   | <p>Given:</p> <p>StudentData={"Name":["Riya","Aman","Sneha","Kunal"],"Marks":[89,67,91,72],<br/>"City":["Delhi","Mumbai","Delhi","Pune"]}</p> <p>(i) Create DataFrame from above data.</p> <p>(ii) Display Name and Marks columns.</p> <p>(iii) Display first two records.</p> <p>(iv) Display records where Marks &gt; 80.</p> <p>(v) Add new column Grade.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | (5)   |         |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| 37.   | <p>(A) Consider table PRODUCT:</p> <table><tr><th>PID</th><th>PNAME</th><th>PRICE</th><th>COMPANY</th></tr><tr><td>P1</td><td>Laptop</td><td>55000</td><td>Dell</td></tr><tr><td>P2</td><td>Printer</td><td>12000</td><td>HP</td></tr><tr><td>P3</td><td>Scanner</td><td>8000</td><td>Canon</td></tr></table> <p>Write SQL commands:</p> <p>(i) Insert a new record: P4, 'Tablet', 25000, 'Samsung'</p> <p>(ii) Add column WARRANTY.</p> <p>(iii) Display products of HP company.</p> <p>(iv) Delete record of Scanner.</p> <p>(v) Change price of Laptop to 60000.</p> <p><b>OR</b></p> <p>Write SQL queries:</p> <p>(i) Display square root of 81.</p> <p>(ii) Display current date.</p> <p>(iii) Find length of string “Informatics”.</p> <p>(iv) Display first 4 characters of “Kendriya”.</p> <p>(v) Remove leading spaces from string “CBSE”</p> | PID   | PNAME   | PRICE | COMPANY | P1    | Laptop    | 55000 | Dell | P2 | Printer | 12000 | HP  | P3 | Scanner | 8000 | Canon | (5) |
| PID   | PNAME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PRICE | COMPANY |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| P1    | Laptop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 55000 | Dell    |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| P2    | Printer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 12000 | HP      |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |
| P3    | Scanner                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8000  | Canon   |       |         |       |           |       |      |    |         |       |     |    |         |      |       |     |

**KENDRIYA VIDYALAYA SANGATHAN**  
**UNSOLVED SAMPLE QUESTION PAPER**  
**SUBJECT: INFORMATICS PRACTICES (065)**

Class - XII  
M.M.- 70

Set: 3  
Time - 03:00 Hrs

**General Instructions:**

1. Please check this question paper contains 37 questions.
2. All questions are compulsory. However, internal choices have been provided in few questions.  
Attempt only one of the choices in such questions.
3. The paper is divided into 5 Sections- A, B, C, D and E.
4. Section A consists of 21 questions (1 to 21). Each question carries 1 Mark.
5. Section B consists of 7 questions (22 to 28). Each question carries 2 Marks.
6. Section C consists of 4 questions (29 to 32). Each question carries 3 Marks.
7. Section D consists of 2 questions (33 to 34). Each question carries 4 Marks.
8. Section E consists of 3 questions (35 to 37). Each question carries 5 Marks.
9. All programming questions are to be answered using Python Language only.
10. In case of MCQ, text of the correct answer should also be written.

| Q. NO. | Section-A (21 x 1 = 21 Marks)                                                                                                                                                                                                    | Marks |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1      | State whether the following statement is True or False:<br>In Pandas, the head() function is used to display the last few rows of a Series.                                                                                      | 1     |
| 2      | A _____ is a device that connects the organization's network with the outside world of the Internet.<br>A. Hub      B. Modem      C. Gateway      D. Repeater                                                                    | 1     |
| 3      | Which of the following SQL functions does not belong to the Math functions category?<br>A. POWER()      B. ROUND()      C. LENGTH()      D. MOD()                                                                                | 1     |
| 4      | In Pandas which of the following DataFrame attribute can be used to know the number of rows and columns in a DataFrame<br>A. size      B. index      C. count      D. shape                                                      | 1     |
| 5      | Output of the query: SELECT LCASE (MONTHNAME ('2023-03-05'));<br>A. May      B. March      C. may      D. march                                                                                                                  | 1     |
| 6      | In Python Pandas, while performing mathematical operations on series, index matching is implemented and all missing values are filled in with _____ by default.<br>A. Null      B. Blank      C. NaN      D. Zero                | 1     |
| 7      | Collection of hyper linked documents available on the internet is known as _____.<br>A. Website      B. Webpage      C. Web Server      D. Web Hosting                                                                           | 1     |
| 8      | How can you get the number of elements in a Series?<br>A. s.length()      B. s.count()      C. len(s)      D. Both B and C                                                                                                       | 1     |
| 9      | Which protocol allow us to have voice calls over the internet?<br>A. HTTP      B. VoIP      C. VideoChat      D. SMTP                                                                                                            | 1     |
| 10     | Which of the following Python statements is used to write a Pandas DataFrame df to a CSV file?<br>A. df.to_csv()      B. df.write_csv()      C. df.to_table()      D. df.export_csv()                                            | 1     |
| 11     | In India, the primary law that deals e-commerce and cybercrime is _____.<br>A. Cybercrime Prevention Act, 2000      B. Digital Security Act, 2000<br>C. Information Technology Act, 2000      D. E-Commerce Regulation Act, 2008 | 1     |
| 12     | The plot() function of Matplotlib module will creates a _____ chart.                                                                                                                                                             | 1     |

|    |                                                                                                                                                                                                                                                                                                                                                                                      |   |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|    | A. Line      B. Scatter      C. Bar      D. Area                                                                                                                                                                                                                                                                                                                                     |   |
| 13 | Stealing someone's intellectual work and representing it as another person's work is known as .<br>A. Phishing      B. Spamming      C. Plagiarism      D. hacking                                                                                                                                                                                                                   | 1 |
| 14 | Which of the following is NOT an aggregate function in SQL?<br>A. MIN()      B. SUM()      C. UPPER()      D. AVG()                                                                                                                                                                                                                                                                  | 1 |
| 15 | How to access a column named "Marks" from DataFrame df?<br>A. df.Marks      B. df["Marks"]      C. df.get("Marks")      D. All of the above                                                                                                                                                                                                                                          | 1 |
| 16 | Which of the following SQL function is used to count the non-NULL values in a column named colnm?<br>A. COUNT(*)      B. COUNT(colnm)      C. SUM(colnm)      D. AVG(colnm)                                                                                                                                                                                                          | 1 |
| 17 | What will s.loc['x'] return if 'x' is not in the Series index?<br>A. NaN      B. 0      C. Error      D. None                                                                                                                                                                                                                                                                        | 1 |
| 18 | Predict the output of the following query: SELECT MOD (9,0);<br>A. 0      B. NULL      C. NaN      D. 9                                                                                                                                                                                                                                                                              | 1 |
| 19 | An organization purchase new computers every year and dumps the old one into the local dumping yard. Write the name of the most appropriate category of waste that the organization is creating every year, out of the following options:<br>A. Business waste      B. Commercial waste      C. E-waste      D. Green waste                                                          | 1 |
| 20 | Assertion (A): MODEM stands for modulator-demodulator.<br>Reasoning (R): It is a computer hardware device that converts data from a digital format to analog and vice versa.<br>A. Both A and R are true and R is the correct explanation for A<br>B. Both A and R are true and R is not the correct explanation for A<br>C. A is True but R is False<br>D. A is false but R is True | 1 |
| 21 | Assertion (A): The INSERT INTO command is a DML command.<br>Reason (R): DML commands are used to insert, update or delete the data stored in a database.<br>A. Both A and R are true and R is the correct explanation for A<br>B. Both A and R are true and R is not the correct explanation for A<br>C. A is True but R is False<br>D. A is false but R is True                     | 1 |
|    | <b>Section-B (7X2 = 14 Marks)</b>                                                                                                                                                                                                                                                                                                                                                    |   |
| 22 | Briefly explain the basic concepts of a web server and web hosting.<br><b>OR</b><br>Rati is doing a course in networking. She is unable to understand the concept of URL. Help her by explaining it with the help of suitable example                                                                                                                                                | 2 |
| 23 | Define the term Alternate Key in a database. Explain how it is different from a Candidate Key.                                                                                                                                                                                                                                                                                       | 2 |
| 24 | Mitali created following data frame using list of dictionaries, but it shows some errors on execution. Help her to find errors and rewrite the correct code.<br>Import pandas as pd<br>d1={'acc':98,'bst':95,'eco':88}<br>d2={'acc':94,'bst':87,'eco':79}<br>d3={'acc':89,'bst':76,'eco':81}<br>df=pd.DataFrame((d1, d2, d3), index=['Meet', 'Ram', 'Smita', 'Rohan'])<br>print(df)  | 2 |
| 25 | Define digital footprints. Differentiate between active and passive digital footprints                                                                                                                                                                                                                                                                                               | 2 |
| 26 | Predict the output of the given Python code:                                                                                                                                                                                                                                                                                                                                         | 2 |

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------|--------------|-----------|---------|-------------|-----------|-------------|-------|----------|-------------|-------|-------------|--------|-------|---------------|-------------|----------------|----------|--------------------|------|---|
|                                   | <pre>import pandas as pd list1=[-10,-20,-30] ser = pd.Series(list1*2) print(ser) <b>OR</b> Complete the given Python code to get the required output as: Rajasthan import _____ as pd di = {'Corbett': 'Uttarakhand', 'Sariska':'Rajasthan', 'Kanha': 'Madhya Pradesh', 'Gir':'Gujarat'} NP = _____. Series( _____ ) print(NP[ _____ ])</pre>                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| 27                                | What is e-waste? Mention any one impact of e-waste on the environment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 2                  |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| 28                                | Consider the given SQL string: <b>“12#All the Best!”</b><br>Write suitable SQL queries for the following:<br>i. Returns the position of the first occurrence of the substring “the” in the given string.<br>ii. To extract last five characters from the string. <b>OR</b><br>What are aggregate functions in SQL? Name any two with examples.                                                                                                                                                                                                                                                                                                                                                                                                                    | 2                  |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>Section-C (4X3 = 12 Marks)</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| 29                                | Identify the type of cybercrime for the following situations:<br>I. A person complains that Rs. 4.25 lacs have been fraudulently stolen from his/her account online via some online transactions in two days using NET BANKING.<br>II. A person complains that his/her debit/credit card is safe with him still somebody has done shopping /ATM transaction on this card.<br>III. A person complains that somebody has created a fake profile of Facebook and defaming his/her character with abusive comments and pictures.                                                                                                                                                                                                                                      | 3                  |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| 30                                | Write a Python program to create the following DataFrame using a list of dictionaries.<br><table><tr><td></td><td><b>Product</b></td><td><b>Price</b></td></tr><tr><td><b>0</b></td><td>Laptop</td><td>60000</td></tr><tr><td><b>1</b></td><td>Desktop</td><td>45000</td></tr><tr><td><b>2</b></td><td>Monitor</td><td>15000</td></tr><tr><td><b>3</b></td><td>Tablet</td><td>30000</td></tr></table> <b>OR</b><br>Write a Python Program to create a Pandas Series as shown below using a dictionary. Note that the left column indicates the indices and the right column displays the data.<br><table><tr><td><b>Russia</b></td><td>Moscow</td></tr><tr><td><b>Hungary</b></td><td>Budapest</td></tr><tr><td><b>Switzerland</b></td><td>Bern</td></tr></table> |                    | <b>Product</b>   | <b>Price</b> | <b>0</b>  | Laptop  | 60000       | <b>1</b>  | Desktop     | 45000 | <b>2</b> | Monitor     | 15000 | <b>3</b>    | Tablet | 30000 | <b>Russia</b> | Moscow      | <b>Hungary</b> | Budapest | <b>Switzerland</b> | Bern | 3 |
|                                   | <b>Product</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Price</b>       |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>0</b>                          | Laptop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 60000              |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>1</b>                          | Desktop                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 45000              |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>2</b>                          | Monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 15000              |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>3</b>                          | Tablet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 30000              |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>Russia</b>                     | Moscow                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>Hungary</b>                    | Budapest                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| <b>Switzerland</b>                | Bern                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| 31                                | I. Write an SQL statement to create a table named STUDENTS, with the following specifications:<br><table><tr><td><b>Column Name</b></td><td><b>Data Type</b></td><td><b>Key</b></td></tr><tr><td>StudentID</td><td>Numeric</td><td>Primary Key</td></tr><tr><td>FirstName</td><td>Varchar(20)</td><td></td></tr><tr><td>LastName</td><td>Varchar(10)</td><td></td></tr><tr><td>DateOfBirth</td><td>Date</td><td></td></tr><tr><td>Percentage</td><td>Float(10,2)</td><td></td></tr></table> II. Write SQL Query to insert the following data in the Students Table<br>1, Supriya, Singh, 2010-08-18, 75.5                                                                                                                                                         | <b>Column Name</b> | <b>Data Type</b> | <b>Key</b>   | StudentID | Numeric | Primary Key | FirstName | Varchar(20) |       | LastName | Varchar(10) |       | DateOfBirth | Date   |       | Percentage    | Float(10,2) |                | 2+1      |                    |      |   |
| <b>Column Name</b>                | <b>Data Type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Key</b>         |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| StudentID                         | Numeric                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Primary Key        |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| FirstName                         | Varchar(20)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| LastName                          | Varchar(10)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| DateOfBirth                       | Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |
| Percentage                        | Float(10,2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                  |              |           |         |             |           |             |       |          |             |       |             |        |       |               |             |                |          |                    |      |   |

Consider the following tables:

**EMPLOYEE**

| EMP_ID | EMP_NAME | EMP_CITY  |
|--------|----------|-----------|
| 1      | ABHINAV  | AGRA      |
| 2      | KABIR    | FARIDABAD |
| 3      | ESHA     | NOIDA     |
| 4      | PAUL     | SEOUL     |
| 5      | VICTORIA | LONDON    |

**PAYROLL**

| EMP ID | DEPARTMENT  | DESIGNATION | SALARY |
|--------|-------------|-------------|--------|
| 1      | SALES       | MANAGER     | 75000  |
| 2      | SALES       | ASSOCIATE   | 50000  |
| 3      | ENGINEERING | MANAGER     | 95000  |
| 4      | ENGINEERING | ENGINEER    | 70000  |
| 5      | MARKETING   | MANAGER     | 65000  |

Write appropriate SQL queries for the following:

- 1) Display department-wise average Salary.
- 2) List all designations in the decreasing order of Salary.
- 3) Display employee name along with their corresponding departments.

**OR**

Consider the following tables:

**ATHLETE**

| AthleteID | Name  | Country |
|-----------|-------|---------|
| 101       | Arjun | India   |
| 102       | Priya | India   |
| 103       | Asif  | UAE     |
| 104       | Rozy  | USA     |
| 105       | David | Denmark |

**MEDALS**

| AthleteID | Sport      | Medals |
|-----------|------------|--------|
| 101       | Swimming   | 8      |
| 102       | Track      | 3      |
| 103       | Gymnastics | 5      |
| 104       | Swimming   | 2      |
| 105       | Track      | 6      |

Write appropriate SQL queries for the following:

- 1) Display the sports-wise total number of medals won.
- 2) Display the names of all the Indian athletes in uppercase.
- 3) Display the athlete's name along with their corresponding sports

**Section-D (2X4 = 8 Marks)**

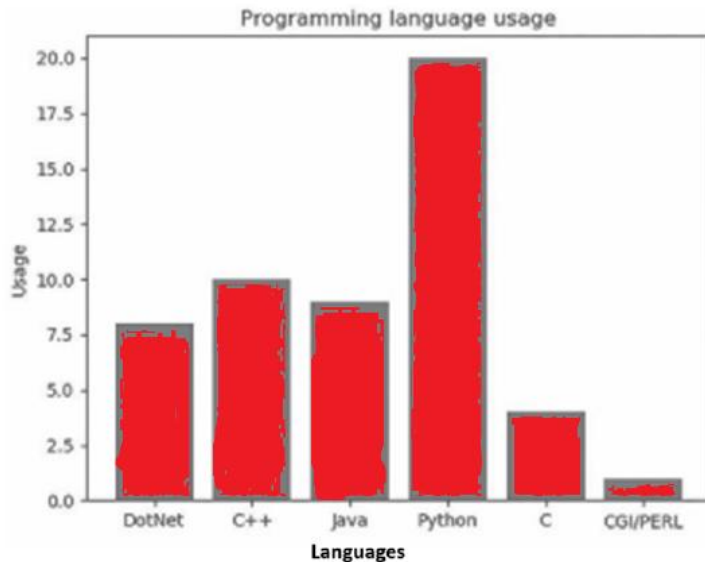
33

During a practical exam, a student Ankita has to fill in the blanks in a Python program that generates a bar chart. This bar chart represents the Name of Language and its percentage usage in one year.

4

| Name of Language | Usage in % |
|------------------|------------|
| Dotnet           | 7.5        |
| C++              | 10         |
| Java             | 8          |
| Python           | 18.5       |
| C                | 4          |
| CGI/PERL         | 1.5        |

Please Help Ankita to complete the code.



```
import _____ as plt # Statement 1
Language=['DotNet','C++','Java','Python','C','CGI/PERL']
Usage = [7.5,10.0,8.0,18.5,4.0,1.5]
plt.bar(_____, Usage, color='r') #Statement 2
plt.ylabel('Usage')
plt._____('Language') #Statement 3
plt.title('Programming Language Usage')
plt.show()
plt._____("aa.jpg") #Statement 4
```

- 1) Write the suitable code for the import statement in Statement-1.
- 2) From graph shown above and fill in the blank in Statement-2 with suitable code.
- 3) Fill in Statement-3 with the name of the function to set the label on the x-axis.
- 4) Fill in the blank in Statement-4 with the name of the function to save the figure.

Rahul, who works as a database designer, has developed a database for a bookshop. This database includes a table BOOK whose column (attribute) names are as below:

Table: BOOK

| B CODE | TITLE                   | AUTHOR          | PRICE |
|--------|-------------------------|-----------------|-------|
| B001   | MIDNIGHT'S CHILDREN     | SALMAN RUSHDIE  | 500   |
| B002   | THE GOD OF SMALL THINGS | ARUNDHATI ROY   | 450   |
| B003   | A SUITABLE BOY          | VIKRAM SETH     | 600   |
| B004   | THE WHITE TIGER         | ARAVIND ADIGA   | 399   |
| B005   | TRAIN TO PAKISTAN       | KHUSHWANT SINGH | 350   |

- i) Write SQL query to display book titles in lowercase.
- ii) Write SQL query to display the highest price among the books.

- iii) Write SQL query to display the number of characters in each book title.  
iv) Write SQL query to display the Book Code and Price sorted by Price in descending order.
- OR**
- Dr. Kavita has created a database for a hospital's pharmacy. The database includes a table named MEDICINE whose column (attribute) names are as below:

Table: **MEDICINE**

| MID | MED_NAME    | SUPP_CITY | STOCK | DEL_DATE   |
|-----|-------------|-----------|-------|------------|
| M01 | PARACETAMOL | MUMBAI    | 200   | 2023-06-15 |
| M02 | AMOXICILLIN | KOLKATA   | 50    | 2023-03-21 |
| M03 | COUGH SYRUP | BENGALURU | 120   | 2023-02-10 |
| M04 | INSULIN     | CHENNAI   | 135   | 2023-01-25 |
| M05 | IBUPROFEN   | AHMEDABAD | 30    | 2023-04-05 |

Write the output of the following SQL Queries.

- Select LENGTH(MED\_NAME) from MEDICINE where STOCK >100;
- Select MED\_NAME from MEDICINE where month(DEL\_DATE) = 4;
- Select MED\_NAME from MEDICINE where STOCK between 120 and 200;
- Select max(DEL\_DATE) from MEDICINE

**Section-E (3X5 = 15 Marks)**

XYZ Media house campus is in Delhi and has 4 blocks named Z1, Z2, Z3 and Z4. The tables given below show the distance between different blocks and the number of computers in each block.

|                      |            |
|----------------------|------------|
| Block Z1 to Block Z2 | 80 metres  |
| Block Z1 to Block Z3 | 65 metres  |
| Block Z1 to Block Z4 | 90 metres  |
| Block Z2 to Block Z3 | 45 metres  |
| Block Z2 to Block Z4 | 120 metres |
| Block Z3 to Block Z4 | 60 metres  |

| Block | Number of computers |
|-------|---------------------|
| Z1    | 135                 |
| Z2    | 290                 |
| Z3    | 180                 |
| Z4    | 195                 |

The company is planning to form a network by joining these blocks.

- Out of the four blocks on campus, suggest the location of the server that will provide the best connectivity. Explain your response.
- For very fast and efficient connections between various blocks within the campus, suggest a suitable topology and draw the same.
- Suggest the placement of the following devices with justification
  - Repeater
  - Hub/Switch
- VoIP technology is to be used which allows one to make voice calls using a broadband internet connection. Expand the term VoIP.
- The XYZ Media House intends to link its Mumbai and Delhi centres. Out of LAN, MAN, or WAN, what kind of network will be created? Justify your answer.

Consider the given dataframe DF and write Python code for the following

|   | QTR1 | QTR2 |
|---|------|------|
| A | 30   | 40   |
| B | 28   | 75   |
| C | 54   | 39   |

- Add a new column QTR3 with value 35,63, & 42 for A, B & C respectively

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|    | <p>II. Add a new row D with values 75, 67 and 83 for QTR1, QTR2 and QTR3 respectively.</p> <p>III. Delete the newly added column QTR3</p> <p>IV. Delete the newly added row D</p> <p>V. Save the content of dataframe to a CSV file "DFdata.CSV"</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |
| 37 | <p>Write suitable SQL query for the following:</p> <ul style="list-style-type: none"> <li>i) Extract 4 characters from the letter 'H' from string 'INDIA SHINING'.</li> <li>ii) Display the position of string 'COME' in the string 'WELCOME WORLD'.</li> <li>iii) Round off the value 78.779 to 2 decimal place.</li> <li>iv) Display the remainder of 149 divided by 6.</li> <li>v) Remove all the expected leading and trailing spaces from a column userid of the table 'USERS' and convert to lowercase.</li> </ul> <p style="text-align: center;">OR</p> <p>Write suitable SQL queries for the following:</p> <ul style="list-style-type: none"> <li>i) To calculate the exponent for 3 raised to the power of 4.</li> <li>ii) To display current date and time.</li> <li>iii) To round off the value -34.4567 to 2 decimal place.</li> <li>iv) To remove all the probable leading and trailing spaces from the column userid of the table named user.</li> <li>v) To display the length of the string 'FIFA World Cup'.</li> </ul> | 5 |